SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:
CZECH INSTITUTE OF INFORMATICS, ROBOTICS AND CYBERNETICS CTU

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.[1] The evaluated unit will describe its organizational structure and size (staffing, number of students, number of study programs implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Self-assessment:

The Czech Institute of Informatics, Robotics, and Cybernetics (CIIRC) at the Czech Technical University (CTU) was founded on July 1, 2013, as the university's youngest institute. Its primary mission is to integrate research capacities in key technological fields in both fundamental and applied research, with artificial intelligence (AI) as the unifying element. CIIRC's application areas include industrial manufacturing, robotics, biomedical systems, smart cities, and intelligent energy distribution. Since its inception, CIIRC has embraced the philosophy of "linking excellence with applications."
The vision of CIIRC is to establish itself as a world-class research institution, recognized on the global research stage and capable of competing with top-tier research organizations. The core activities of the institute rest on three fundamental pillars: excellence in research, advanced infrastructure, and technology transfer with practical applications.

Research and Development Contribution
From its inception, CIIRC has focused on assembling internationally competitive research teams. The institute has successfully attracted leading researchers back to the Czech Republic, including Josef Šivic, Josef Urban and Robert Babuška. Supported by three projects within the „Excellent Research Teams" call of the Operational Program RDE (funded by MEYS), their teams have formed the foundation of CIIRC's basic research since 2017. Already in 2015, Josef Urban received ERC Consolidator Grant, which became the first one at CTU. CIIRC is home institution of many distinguished researchers such as Vladimír Kučera, Tomáš Mikolov, Václav Hlaváč, Olga Štěpánková, Torsten Sattler, Tomáš Pajdla, Zdeněk Hanzálek, Libor Přeučil, Mikoláš Janota, Lenka Lhotská and many others, whose expertise has played a vital role in shaping CIIRC's research excellence.

[1] Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

Following the completion of the CIIRC building in 2017, the institute developed a unique experimental and testing facility - RICAIP Testbed Prague. Supported by the Horizon 2020 Teaming for Excellence RICAIP project with nearly 50 million EUR in funding, this facility focuses on Industry 4.0 concepts. It is equipped with the latest technologies for development and testing innovative solutions for advanced and fully integrated industrial production and processes for smart factories. The first phase of this infrastructure development concluded in 2023. The testbed, a unique facility in CEE, is connected to industrial testbeds at CEITEC BUT and at ZeMA and DFKI in Germany and collaborates with broader network of testing and experimentation facilities across Europe. At the same time, CIIRC has developed research infrastructure for biomedical research, enabling further innovation and knowledge transfer.

By the end of 2023, CIIRC had established a comprehensive AI ecosystem, combining outstanding infrastructure and excellent research teams. Key components include the National Competence Center - Cybernetics and Artificial Intelligence (since 2019). CIIRC has participated within 2 out of 5 Teaming projects in the Czech history – Research and Innovation Centre on Advanced Industrial Production and Center for Artificial Intelligence and Quantum Computing in System Brain Research. CIIRC also takes part within 4 out of 7 projects of the European Networks of Excellence Centres in AI, Data and Robotics (AI NoEs): ELISE, TAILOR, euROBIN, ELIAS and VISION CSA. CIIRC has been involved in several projects of Digital Innovation Hubs (2019) and joined initiatives of EDIH – European Digital Innovation Hub and TEF - AI-MATTERS (2023). These achievements have enabled a balanced distribution of research capacities across basic, applied, and contract research, with fluid transitions between these categories.

CIIRC is deeply engaged in international collaboration, both within and beyond the EU. It plays a pivotal role in connecting Czech AI research with the global community. The institute was instrumental in founding AICZECHIA in 2017, an association of top Czech AI researchers. Today, CIIRC is active in major EU AI associations and is hosting CAIRNE Office Prague, ELLIS Unit Prague and EIT Manufacturing Hub Czechia. Cooperation with business sector and especially SME's is conducted through the ecosystem of the National Centre for Industry 4.0. On the national level, CIIRC contributed to several government strategies – especially in Industry 4.0, National Strategy for AI and NAPAN (National action plan for Alzheimer disease and similar).

Organizational Structure and Resources

In 2023, CIIRC's budget exceeded 520 million CZK (approximately 20 million EUR), with only 4% coming from institutional funding. The institute is predominantly funded through EU grants (42%), national projects (30%), and industry partnerships (24%), making it nearly self-sustainable.

In 2023, the CIIRC employed 254 employees - 181 members of the research staff and 73 members of the admin staff. Administratively, the institute is structured into eight scientific departments, four centres, Director's Office and Project Management Office. An international RICAIP centre is organisationally incorporated under CIIRC with a maximum level of autonomy. Research projects are typically executed by interdisciplinary project teams, fostering collaboration between departments.

The management of CIIRC consists of:

- **Director**: Dr. Ondřej Velek
- **Scientific Director**: Prof. Vladimír Mařík
- **Deputy Directors**: Prof. Vladimír Kučera and Prof. Václav Hlaváč
- **Treasurer**: Ing. Tomáš Masár

The **Managerial Board**, composed of top management and department heads, oversees operations. Additionally, the **Assembly** supports research orientation and researcher career development. CIIRC also benefits from guidance provided by the **Scientific Council** and the **International Advisory Board**.

Educational Contributions and Student Engagement
CIIRC is committed to nurturing young researchers and fostering an inclusive environment for women. The institute's researchers supervise over 90 Ph.D. students across 15 faculties in the Czech Republic and internationally. However, due to current Czech legislation, CIIRC cannot lead its own Ph.D. programs. To address this, the institute established the Ph.D. Education Centre in collaboration with the Faculty of Electrical Engineering at CTU. 32 staff members are engaged in teaching and educational activities across five faculties of CTU.

The institute's key long-term strategic goals include:

1. Keeping and strengthening the position of a premier research and experimental center for intelligent manufacturing and smart production, recognized at a European level and respected by academia and industry worldwide.
2. Continue to strengthen the CIIRC's position as a leading AI research center, driving fundamental AI research and technological breakthroughs, thus enabling the use of new AI methods and technologies by other research communities.
3. Supporting the Czech and European economic and societal transformation through AI applications, including the development of advanced computational and communication infrastructure. To co-create and contribute national and European Strategies, Policies and Action plans.
4. Advancing diagnostics and treatment for neurodegenerative diseases, particularly Alzheimer's and Parkinson's, through AI-driven solutions. This effort has been accelerated through collaboration with leading institutions such as the Brain Institute in Paris, Mayo Clinic, and Leibniz Supercomputing Center within CLARA initiative, under the coordination of the INDRC Centre.

Table 3.1.1 - Staffing per FTE[2]

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	5,8/1,0	5,8/1,0	5,8/1,0	5,8/1,0	5,8/1,0	29,0/5,0
Associate Professor	2,0/0,0	2,0/0,0	2,0/0,0	2,0/0,0	2,0/0,0	10,0/0,0
Assistant Professor	5,1/0,0	5,1/0,0	5,0/0,0	5,0/0,0	5,0/0,0	25,0/0,0
Assistant	0,0/0,0	0,0/0,0	0,0/0,0	0,0/0,0	0,0/0,0	0,0/0,0
R&D Personnel[3]	73,3/15,5	68,8/16,4	63,7/16,4	65,0/17,0	61,2/19,2	331,9/84,5
Researchers in other categories[4]	67,1/5,4	77,4/7,1	82,8/8,6	92,0/9,2	106,8/11,5	426,1/41,7

[2] The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full- time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.
[3] The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).
[4] The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

Technical and economic staff[5]	53,6/40,5	56,3/40,8	57,5/42,5	69,6/54,0	72,9/55,3	309,8/233,0
Scientific, research and development staff involved in teaching activities	12,9/1,0	12,9/1,0	12,8/1,0	12,8/1,0	12,8/1,0	64,0/5,0
Early career researchers[6]	48,6/4,8	56,0/6,9	58,2/8,4	64,5/9,0	69,6/11,2	296,8/40,4
Total[7]	206,8/62,4	215,4/65,2	216,7/68,4	239,3/81,1	253,6/87,0	1131,8/364,1

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the first year of the evaluation period (numbers of physical employees and personnel)[8]

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	1	0	1	0	2	0	2	1
Associate Professor	0	0	0	0	1	0	1	0	0	0	0	0
Assistant Professor	0	0	1	0	3	0	2	0	0	0	0	0
Assistant	0	0	0	0	0	0	0	0	0	0	0	0
R&D Personnel[9]	34	5	37	7	23	6	6	1	3	1	2	0
Researchers in other categories[10]	22	4	36	3	19	2	5	0	2	0	3	0
Technical and economic staff[11]	0	0	0	0	0	0	0	0	0	0	0	0
Scientific, research and development staff involved in teaching activities	0	0	1	0	5	0	4	0	2	0	2	1
Early career researcher[12]	22	4	37	3	0	0	0	0	0	0	0	0
Total[13]	56	9	74	10	47	8	15	1	7	1	7	1

[5] Who participates in the management and support of R&D&I in the institution.
[6] See Definition of Terms in Methodology HEI2025+.
[7] Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.
[8] The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.
[9] The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).
[10] The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).
[11] Who participates in the management and support of R&D&I in the institution.
[12] See Definition of Terms in Methodology HEI2025+.
[13] Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the last year of the evaluation period (numbers of physical employees and personnel)[14]

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	0	0	2	0	1	0	3	1
Associate Professor	0	0	0	0	1	0	1	0	0	0	0	0
Assistant Professor	0	0	0	0	2	0	2	0	1	0	0	0
Assistant	0	0	0	0	0	0	0	0	0	0	0	0
R&D Personnel[15]	18	4	25	5	26	12	5	0	3	1	2	0
Researchers in other categories[16]	58	11	33	5	30	1	9	0	5	0	5	0
Technical and economic staff[17]	0	0	0	0	0	0	0	0	0	0	0	0
Scientific, research and development staff involved in teaching activities	0	0	0	0	3	0	5	0	2	0	3	1
Early career researcher[18]	58	11	33	5	0	0	0	0	0	0	0	0
Total[19]	76	15	58	10	59	13	19	0	10	1	10	1

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	year 1		year 2		year 3		year 4		year 5		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate												

[14] The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

[15] The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

[16] The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

[17] Who participates in the management and support of R&D&I in the institution.

[18] See Definition of Terms in Methodology HEI2025+.

[19] Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

Master's[20]												
Doctoral												
Lifelong Learning Courses												
Total												

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total[21] / Of which professional study programmes											
	year 1		year 2		year 3		year 4		year 5		Total	
Undergraduate												
Master's												
Doctoral												
Lifelong Learning courses												
Total												

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	0,07	Basic Research	68,4
	1.2 Computer and information sciences	68,16	Balanced basic and applied research	
	1.3 Physical sciences	0,08	Basic Research	
	1.4 Chemical sciences		Zvolte položku.	
	1.5 Earth and related environmental sciences		Zvolte položku.	
	1.6 Biological sciences		Zvolte položku.	
	1.7 Other natural sciences		Zvolte položku.	
2. Engineering and Technology	2.1 Civil engineering	2,65	Applied Research	29,77
	2.2 Electrical engineering, Electronic engineering, Information engineering	15,92	Balanced basic and applied research	
	2.3 Mechanical engineering	3,17	Balanced basic and applied research	
	2.4 Chemical engineering		Zvolte položku.	
	2.5 Materials engineering		Zvolte položku.	
	2.6 Medical engineering	5,78	Applied Research	

[20] All master's degree students are listed, regardless of the length of their programme of study.

[21] The total number of study programmes for which admissions have been announced in a given academic year.

	2.7 Environmental engineering		Zvolte položku.	
	2.8 Environmental biotechnology		Zvolte položku.	
	2.9 Industrial biotechnology		Zvolte položku.	
	2.10 Nanotechnology		Zvolte položku.	
	2.11 Other engineering and technologies	2,23	Balanced basic and applied research	
3. Medical and Health Sciences	3.1 Basic medicine	0,25	Basic Research	1,48
	3.2 Clinical medicine	0,72	Applied Research	
	3.3 Health sciences			
	3.5 Other medical sciences	0,51	Applied Research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0,01	Applied Research	0,01
	4.2 Animal and Dairy science		Zvolte položku.	
	4.3 Veterinary science		Zvolte položku.	
	4.4 Other agricultural sciences		Zvolte položku.	
5. Social Sciences	5.1 Psychology and cognitive sciences	0,02	Applied Research	0,33
	5.2 Economics and Business	0,1	Applied Research	
	5.3 Education	0,1	Applied Research	
	5.4 Sociology		Zvolte položku.	
	5.5 Law		Zvolte položku.	
	5.6 Political science		Zvolte položku.	
	5.7 Social and economic geography		Zvolte položku.	
	5.8 Media and communications	0,11	Applied Research	
	5.9 Other social sciences		Zvolte položku.	
6. Humanities and the Arts	6.1 History and Archaeology		Zvolte položku.	0,00
	6.2 Languages and Literature		Zvolte položku.	
	6.3 Philosophy, Ethics and Religion		Zvolte položku.	
	6.4 Arts (arts, history of arts, performing arts, music)		Zvolte položku.	
	6.5 Other Humanities and the Arts		Zvolte položku.	
	Total	100	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the previous five-year period based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Self-assessment:

Prominent Scientists and individual achievements

During the evaluated period, CIIRC continued to strengthen its position as a well-respected research institution at the global, European, and national levels. 299 journal papers and 480 conference papers were published by the research staff.

Thanks to many distinguished scientists, the institute has contributed significantly to the international recognition of Computer Science research at CTU, ranking 5th in Europe for Computer Vision and 7th for Robotics according to the CSRanking in the period 2018-2023. According to Research.com (as of December 2022), Dr. Josef Šivic, doc. Tomáš Pajdla, Dr. Tomáš Mikolov and Dr. Torsten Sattler ranked 2nd, 4th, 7th and 10th position among computer scientists in the Czech Republic. The top-rated research is reflected within the receiving of prestigious individual grants: Dr. Šivic was awarded an ERC Advanced Grant (2023), Dr. Mikoláš Janota secured an ERC-CZ Grant (2020).

Contributions to Applied Research

In applied research, CIIRC has led the Czech Node of the Testing and Experimentation Facilities Network for AI in Manufacturing (AI-MATTERS Project), leveraging equipment and expertise developed through the coordination of the RICAIP EU Teaming for Excellence project. The RICAIP Testbed Prague, built in collaboration with the German DFKI, has become a flagship facility for intelligent manufacturing in the Czech Republic and the broader CEE region.

Since 2023, CIIRC has been the lead entity of the ROBOPROX project, which secured EUR 20 million in funding under the OP JAK "Excellent Research" call. This project focuses on robotics and advanced industrial production, including control and optimization of production processes and computational methods for manufacturing and materials engineering.

CIIRC continues to serve as the National Centre for Industry 4.0, uniting over 60 academic and industrial bodies, together with the Czech Chamber of Commerce and the Confederation of Industry of the Czech Republic. The National Centre for Industry 4.0 has been instrumental in transferring knowledge from academia to industry, supported by the National Centre of Competence for Cybernetics and AI (2019-2022). These centers served as the foundation for EDIH CTU (European Digital Innovation Hub), an effective vehicle for technology transfer providing services to SME and public administration. CIIRC has successfully transferred research outcomes and licensed technologies to global corporations such as Amazon, Google, Siemens, Bosch, Airbus, Rockwell, Škoda Auto, Continental, Huawei and Lego, as well as several Czech SMEs.

Selected prestigious R&D&I awards
International recognition has also been driven by notable achievements, including the success of Dr. Šedivý's team, Alquist AI, which won the prestigious Amazon Alexa Prize in 2021 and secured alternating 2nd and 3rd places in subsequent evaluations. Dr. Urban's team (Dept. of AI) has consistently excelled in global competitions in automatic reasoning and machine learning.

CIIRC researchers have received several best paper awards at prestigious international conferences such as CVPR, ICCV, ECCV, SSCI, ICORES, VEHITS, CASE, ROADEF, RTCSA and others and have been invited to deliver keynote speeches at top-tier (CORE/A*-A) conferences. Between 2019 and 2023, 15 research outcomes were recognized as "excellent" by the Czech R&D&I Council.

Conferences and International Engagements
CIIRC has been at the forefront of organizing and chairing major international conferences, including:

- IEEE SMC Conference (2022) – chaired by Prof. Mařík
- EU-US Workshop on Intelligent Manufacturing (2022) – co-funded by NSF
- IEEE/RSJ IROS (2021) – chaired by doc. Přeučil
- IEEE/ECMR (2019) – chaired by doc. Přeučil

CIIRC has hosted numerous leading global researchers. Notably, the institute maintains strong collaborations with DFKI and Prof. Wahlster (co-author of the original Industry 4.0 strategic initiative), as well as with the National Institute of Informatics in Tokyo and the Mayo Clinic in Rochester, Minnesota. These partnerships provide Czech researchers with opportunities for extended research stays at top international institutions.

Editorial Boards and Professional Societies
CIIRC faculty members hold key editorial positions in international journals (see the table below) and have been elected members of prestigious professional societies. Notable distinctions include:

- Prof. Vladimír Kučera's election to the prestigious US Philosophical Society in 2023, becoming only the fifth Czech citizen to receive this honor,
- Prof. Vladimír Mařík's appointment as an IEEE Life Fellow in 2023,
- Prof. Vladimír Kučera's receipt of the "Czech Mind" award in 2021, a highly prestigious national recognition granted annually,
- Prof. Vladimír Mařík's honorary doctorate from NIMS University in Jaipur, India, in 2023

Prominence in AI Research Networks
CIIRC has been actively involved in four out of six European Networks of Excellence Centres in AI, Data, and Robotics (AI NoEs): ELISE, TAILOR, euROBIN, and ELIAS. Moreover, CIIRC had a pivotal role in the VISION CSA project, facilitating and coordinating cooperation among all AI NoEs. These activities have firmly established CIIRC as a reliable and influential partner within the European AI ecosystem. CIIRC has been an engaged member of CAIRNE (Confederation of Laboratories for Artificial Intelligence Research in Europe, formerly CLAIRE) and ELLIS (European Laboratory for Learning and Intelligent Systems), two of the most significant AI initiatives in Europe. CIIRC also leads the CAIRNE Office Prague, the ELLIS Unit Prague, and EIT Manufacturing Hub Czechia, further reinforcing its impact on the European AI research landscape. CIIRC is also a member of associations ADRA, IDSA and Gaia-X.

Evaluations and Strategic Influence

CIIRC researchers actively participate in evaluation panels for national and EU projects, including the ERC project review panels. Additionally, CIIRC experts contribute to research policy at the governmental level, serving on the Commission for the Evaluation of Research Results (KHV) under the Czech R&D&I Council. Prof. Mařík acted in the evaluated period as a vice-chair of the Czech R&D&I Council.

International Collaboration
CIIRC has played a crucial role in establishing MICARC (Marik Institute of Computing, AI, Robotics, and Cybernetics) at NIMS University in Jaipur, India, established in 2023 and set to open in April 2025. Serving as a model for successful AI institutes, CIIRC has been instrumental in designing the facility's infrastructure, aligning it with CIIRC's standards, and developing educational programs for Ph.D. candidates. The selection of CIIRC as a blueprint for this initiative underscores its international recognition and appreciation.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
prof. Dr. Ing. Zdeněk Hanzálek et al.	Best Industrial Paper Award: Accelerated RRT* and Its Evaluation on Autonomous Parking	VEHITS Conference 2019
RNDr. Martin Suda, Ph.D.et al.	World Championship in Automated Theorem Proving for Vampire system.	The CADE ATP System Competition 2019
doc. Ing. Přemysl Šůcha, Ph.D et al	Industry 4.0 Award 2020 for Blumenbecker Prag, CIIRC CTU and FSI BUT	Confederation of Industry of the Czech Republic
Dr. Ing. Josef Šivic et al.	The Overall Best Method for Paper "CosyPose: Consistent multi-view multi-object 6D pose estimation"	ECCV 2020
Ing. Pavel Burget, Ph.D., Ing. Alexandr Lazarov, doc. Ing. Petr Kadera, Ph.D., PhDr. Mgr. Vít Dočkal, Ph.D., Ing. Jaroslav Lískovec	European Citizen's Prize 2020 for half mask CIIRC RP95-3D	European Parliament
prof. Ing. Vladimír Kučera, DrSc., dr. h. c.	Česká hlava Award 2021	Government of the Czech Republic
Ing. Jan Šedivý, CSc. and Alquist AI Team	Amazon Alexa Prize Social Bot Grand Challenge 2021, 1st place	Amazon Science
doc. Ing. Tomáš Pajdla, Ph.D. et al.	Best Paper Award for „Learning to Solve Hard Minimal Problems"	CVPR 2022
prof. Ing. Vladimír Kučera, DrSc., dr. h. c.	Member of the American Philosophical Society 2023	American Philosophical Society
Ing. Tomáš Mikolov, Ph.D.	Test of Time Award for "Distributed Representations of Words and Phrases and their Compositionality,"	NeurIPS 2023

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Dr. Ing. Josef Šivic	International Journal of Computer Vision, ISSN 0920-5691

Dr. Ing. Josef Šivic	IEEE Transactions of Pattern Analysis and Machine Intelligence, ISSN 0162-8828
prof. Dr. Ing. Robert Babuška	IEEE Transactions on Pattern Analysis and Machine Intelligence, ISSN 0162-8828
prof. Ing. Vladimír Kučera, DrSc., dr. h. c.	International Journal of Robust and Nonlinear Control, ISSN 1049-8923, 1099-1239
prof. Ing. Vladimír Kučera, DrSc., dr. h. c.	Bulletin of the Polish Academy of Sciences, ISSN 2300-1917
prof. Ing. Vladimír Mařík, DrSc., dr. h. c.	Transactions on large-scale data- and knowledge-cantered systems, ISSN 1869-1994
doc. Ing. Václav Křemen, Ph.D., MBA	IEEE Journal of Translational Engineering in Health and Medicine, ISSN 2168-2372
doc. Ing. Václav Křemen, Ph.D., MBA	Frontiers in Neurology, ISSN 1664-2295
doc. Ing. Lenka Lhotská, CSc.	Engineering Applications of Artificial Intelligence, ISSN 1873-6769
doc. Ing. Lenka Lhotská, CSc.	Transactions on large-scale data- and knowledge-cantered systems, ISSN 1869-1994

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Dr. Ing. Josef Šivic	"Estimating motion and forces of person-object interactions from monocular video"	Google DeepMind, London, UK	2019
prof. Dr. Ing. Robert Babuška	Kenote: "Data-driven construction of parsimonious analytic models for autonomous robots"	ECMR, Prague, CZ	2019
Ing. Jiří Kubalík, Ph.D.	Symbolic Regression for Constructing Accurate Generalized Linear Models	AI Group, Dept. of Computer Science, University of York, UK	2020
Mgr. Josef Urban, Ph.D.	AI and Theorem Proving	New Technologies in Mathematics Seminar, Harvard University, USA	2021
Mgr. Josef Urban, Ph.D.	Towards the Dream of Self-Improving Universal Reasoning AI	AGI, Palo Alto, USA	2021
doc. Ing. Václav Křemen, Ph.D., MBA	Keynote: Neuroengineering of Epilepsy Neurostimulation	Yale Comprehensive Epilepsy Center, New Haven, Connecticut	2022
doc. Ing. Václav Křemen, Ph.D., MBA	Brain Restoration-Intelligent-Sensing-Stimulation-Ecosystem in Neurology (BrainRISE)	AI Summit Mayo Clinic Rochester, Minnesota, USA	2022
Ing. arch. Michal Postránecký	Smart City Strategies and Sectors	Saitama Sustainable Cities Summit ~E-KIZUNA Global Summit~, Tokyo, Japan	2022
Ing. Milan Němý, Ph.D.	Tiny Dots: Basal Forebrain Connectivity in Normal Aging and Alzheimer's Disease.	Boston: Neuromodulatory Subcortical Systems PIA, Harvard Medical School, USA	2023
prof. Ing. Vladimír Mařík, DrSc., dr. h. c.	RICAIP Centre for Intelligent Manufacturing	Industrial AI Forum, Univ. of Maryland, USA	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Prof. Dr. rer. nat. Dr. h.c. mult. Wolfgang Wahlster	Professor of Artificial Intelligence (AI), the founding director and currently Chief Executive Advisor (CEA) of the German Research Center for Artificial Intelligence (DFKI);	Industrial AI: Towards the Next Level of Industrie 4.0" Hybrid Industrial AI Solutions for Industrie 4.0 Industrial Artificial Intelligence for Zero-Defect Manufacturing: The Next Decade of Industrie 4.0 Edge AI for Sustainable Industrie 4.0	2019 2020 2021 2022
Prof. Dr. Holger H. Hoos	Alexander von Humboldt Professor (since 01.01.2022) for Computer Science of the Faculty of Mathematics, Informatics and Natural Sciences at RWTH Aachen University, Germany; Leiden University, Netherlands; Chair of the Board of Directors and founding member of CAIRNE - Confederation of Laboratories for Artificial Intelligence Research in Europe	Meet the European AI Ecosystem How and why AI will shape the future of science and engineering	2023 2023
Prof. Jay Lee	Univ. Distinguished Professor, Industrial AI Center, University of Cincinnati, USA Ohio Eminent Scholar, L.W. Scott Alter Chair Founding Director, NSF I/UCRC on Intelligent Maintenance Systems (IMS) Professor Emeritus since 2023	Industrial AI-Augmented Predictive Analytics for Highly-Connected Smart Manufacturing	2022
Prof. Dr. Mario Fritz	Faculty member at CISPA Helmholtz Center for Information Security, an honorary professor at Saarland University, and a fellow of the European Laboratory for Learning and Intelligent Systems (ELLIS)	ELSA – European Lighthouse on Secure and Safe AI	2023
Prof. Dr.-Ing. Martin Ruskowski	Technologie-Initiative SmartFactory-KL e.v., Head of the Innovative Factory Systems research department at the German Research Center for Artificial Intelligence (DFKI); Head of Chair, Department of Machine Tools and Control Systems (WSKL), RPTU Rheinland-Pfälzische Technische Universität Kaiserslautern-Landau in Kaiserslautern	Resilient, Sustainable, Future-oriented. Production Level 4 stands for the production of tomorrow	2022
Prof. Dr.-Ing. Steffen Ihlenfeldt	Director, Fraunhofer Institute for Machine Tools and Forming Technology IWU, Germany	Cognitive Production Systems: Technical Implementation on the Example of Machining Processes	2022
Patrick Pérez	Scientific Director of Valeo.ai, France	Autonomous Driving. Advances and Challenges	2022
Prof. François Yvon, Ph.D.	Senior Researcher, LISN-CNRS / Université Paris Saclay, France Formerly also Professor at the Department of Computer Science at Paris-Sud University and Director of LIMSI (Computer Science Laboratory for Mechanics and Engineering) of	How Multilingual are Large Multilingual Language Models?	2022

	the CNRS (National Center of Scientific Research)		
Prof. Céline Castets-Renard	Full Professor, Faculty of Law, Civil Law Section University Research Chair on Accountable Artificial Intelligence in a Global Context (uOttawa) Chair Law, Accountability and Social Trust in IA (Université de Toulouse)	From Ethics to AI Law: What is the Main Provision of the AI Act Regarding Social Issues?	2022
Federico M. Sciammarella Ph.D	President & CTO of MxD Chicago, USA previously associate professor at Northern Illinois University	Secure Digital Transformation in Action for US Manufacturing	2022

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
doc. Ing. Lenka Lhotská, CSc.	Panellist and Referee	Swiss National Science Foundation	2022-now
doc. Ing. Petr Kadera, Ph.D.	Erigrid, Erigrid2	H2020 INFRAIA-1-2014-2015: Integrating and opening existing national and regional research infrastructures of European interest	2016-now
prof. RNDr. Olga Štěpánková, CSc.	P103 Cybernetics and Information Processing	GAČR – Czech Science Foundation	2021-2023
Mgr. Josef Urban, Ph.D.	P103 Cybernetics and Information Processing	GAČR – Czech Science Foundation	2017-2020
Mgr. Josef Urban, Ph.D.	AI Chairs Program	French National Research Agency	2019
prof. Dr. Ing. Robert Babuška	Reviewer of ERC Projects	European Research Council	2021
Dr. Ing. Josef Šivic	ERC Starting, Consolidator and Advanced grants	European Research Council	2020 - 2024
Dr. Ing. Josef Šivic	Reviewer of Canada CIFAR AI Chairs	Canadian Institute for Advanced Research (CIFAR)	2019
doc. Ing. Tomáš Pajdla, Ph.D.	ERC Advanced Grant Peer Review Panel member	European Research Council	2021, 2023
doc. Ing. Tomáš Pajdla, Ph.D.	M17+ EP7 Panel member	The Research, Development and Innovation Council of the Czech Republic	2021-2023

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research[22]) that it has implemented or participated in during the evaluation period[23]. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)[24], regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in the listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

Self-assessment:

CIIRC CTU has selected the following projects:

1. AI4REASON: Artificial Intelligence for Large-Scale Computer-Assisted Reasoning
2. AI&Reasoning: Artificial Intelligence and Reasoning
3. IMPACT: Intelligent Machine Perception
4. NCC CAI: National Competence Center – Cybernetics and Artificial Intelligence
5. NCC CAI: National Competence Center – Cybernetics and Artificial Intelligence
6. VISION: Value and Impact through Synergy, Interaction and cooperation of Networks of AI Excellence Centres
7. euROBIN: European ROBotics and AI Network
8. AI-MATTERS: AI MAnufacturing Testing and experimenTation network For EuROpean industrieS
9. ROBOPROX: Robotics and advanced industrial production
10. Smart Counting Machines for Modular Industry 4.0 Packing Lines in LEGO

AI4REASON: Artificial Intelligence for Large-Scale Computer-Assisted Reasoning

(EC, ERC Consolidator, 2015-2020, budget: EUR 1,5 million)

In the areas of AI and automation of reasoning, it is extremely difficult to automatically prove theorems in large and complex theories. The AI4REASON project of the main investigator Dr. Josef Urban aimed to find a solution to this very complicated problem by developing novel AI methods. To do so, it created appropriate automated reasoning and machine learning techniques.

Results: The main measurable breakthroughs are large increases in the power of automated theorem proving over large formal corpora. Several new methods combining learning and proving have been developed, including direct guidance of tactical ITPs, several new approaches to premise selection and internal guidance of ATPs, conjecturing, and auto formalization.

Application potential: The main impact of the project is in AI and reasoning. The large increase in the power of the methods will likely have an immediate impact on industrial verification projects, increasing the production of fully verified software, hardware, and other technological designs. This has in turn impact on preventing costly failures of advanced technologies on which modern society critically depends. A long-term impact of this research field is increased automation of mathematics and science.

[22] For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

[23] Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

[24] The evaluated unit shall only fill tables that are relevant to it.

Contribution to mission and purpose of the evaluated unit: The transferability of the grant allowed the PI to make his move back to Czechia, bringing the first ERC to CTU.

Role: Beneficiary

Interdisciplinary aspects: Automated reasoning is applied in many areas, from research mathematics to software and hardware verification. Some of the developed methods have helped to produce new mathematical results that the experts in the field consider interesting. Automation methods were produced, which helped speed up all sorts of formal verification in the major formal proof assistants.

AI&Reasoning: Artificial Intelligence and Reasoning

(MSMT, 2017-2023, budget: EUR 4,8 million)

The main goal of the AI&Reasoning project was to build a new research group led by Dr. Josef Urban, holder of the ERC Consolidator Grant, focused on research in artificial intelligence and automatic reasoning, in collaboration with strategic international partners. The project focused on automated translation of mathematical, scientific and technical texts written in a natural language into a form that will be comprehensible for computers.

Results: Transfer of completely new methods of automatic reasoning and their use in the field of control technology, real-time scheduling, agent systems and big data, which the team was able to develop.

Application potential: The aim was knowledge transfer in the field of managing international grants (especially H2020 and ERC). The project results can advance applications in areas like robotics cell optimization and AI for Smart Cities.

Contribution to mission and purpose of the evaluated unit: The project contributed to fulfilling CIIRC CTU's vision as a “state-of-the-art research institute integrating the best research teams, young talents and unique know-how, pushing the boundaries of technical knowledge, motivating world-class performances and educating future generations of international figures”.The related objective was the development of strategic international cooperation in the form of: deepening (expanding cooperation from the "individual" level to the institutional level). Another objective was the modernization of R&D infrastructure, in the form of acquisition of equipment for carrying out research activities, transfer of best practice in the field of quality management.

Role: Beneficiary (Partners: Technical University of Ostrava, University of West Bohemia)

Interdisciplinary aspects: The research in the fields of artificial intelligence and automatic reasoning was coupled with knowledge transfer in the field of managing international grants.

IMPACT: Intelligent Machine Perception (MSMT, 2017-2023, budget: EUR 4,6 million)

The IMPACT project focused on fundamental and applied research in computer vision, machine learning and robotics to develop intelligent systems that understand complex visual inputs, learn, reason, navigate and interact with dynamic environments. This all autonomously or with only minimal human supervision.

Results: A dynamic, young research team benefitted from the unique expertise of Dr. Josef Šivic, an ERC Starting Grant holder with strong experience and links to the strategic international partner, INRIA. Entirely

new machine learning methods were transferred to the team. The quality of publishing performance of the team was also improved thanks to the realization of an attractive research program in cooperation with world class researchers from INRIA and other countries.

Application potential: The main impact of the project was the transfer of knowledge in the field of international grants (especially H2020 and ERC) and the increase of the success of the grants within the team, including the award of the ERC Advanced grant to J. Šivic in 2023, through the development of strategic international cooperation, in the form of deepening (expanding cooperation from an individual level to an institutional level, sharing best practice at the strategic level,) and targeting selected areas, especially coordination grants, ERC grants, attestation and evaluation policy, etc.

Contribution to mission and purpose of the evaluated unit: The project contributes to fulfilling the CIIRC´s vision as a state-of-the-art research institute integrating the best research teams, young talents and unique know-how, pushing the boundaries of technical knowledge, motivating world-class performances and educating future generations of internationally based personalities.

Role: Beneficiary

Interdisciplinary aspects: The research in the fields of computer vision, machine learning and robotics was coupled with knowledge transfer in the field of managing international grants.

NCC CAI: National Centre of Competence – Cybernetics and Artificial Intelligence

(TACR, 2019-2022, budget: EUR 6,3 million)

The National Competence Center – Cybernetics and Artificial Intelligence (NCC CAI) project aimed to create a national platform for cybernetics and artificial intelligence which interlinks research and application-oriented centers of robotics and cybernetics for Industry 4.0, Smart Cities, intelligent transport systems and cybersecurity. The connection of innovation leaders raised effectiveness of applied research in key areas, as advanced technology for globally competitive industry, ICT and transportation for the 21st century.

Results: The output of the cooperation of research and application partners is 78 binding results - 28 software results, 20 functional samples, 4 prototypes, 3 verified technologies, one specialized map and 22 other results.

Application potential: NCC CAI was closely related to the application sector and enables cross-domain collaboration, innovation development and technology transfer in 22 sub-projects.

Contribution to mission and purpose of the evaluated unit: NCC CAI has positively contributed to increasing the number of R&D workers and the involvement of young researchers – doctoral and master's students – in projects with industry. Cooperation at the center level significantly contributed to long-term cooperation of researchers on other national or international projects.

Role: Beneficiary (Partners: 3 universities, 3 institutes of Czech Academy of Sciences, and 22 companies incl. Škoda Auto, Siemens, Valeo, DEL and more)

Interdisciplinary aspects: The center has contributed to the transfer of technologies in key fields with growth prospects, to further connecting research and application partners from all over the Czech Republic, strengthening interdisciplinary cooperation and increasing the

competitiveness of companies.

Collaboration with other units of the evaluated HEI: Faculty of Mechanical Engineering, Faculty of Architecture, and Faculty of Transportation Sciences

RICAIP: Research and Innovation Centre on Advanced Industrial Production

(EC, MSMT, 2019-2026, budget: EUR 47,0 million).

RICAIP is a Czech-German distributed research centre of excellence (CoE), which focuses on research in the field of robotics, machine learning and artificial intelligence (AI) for advanced industry and develops new production concepts for geographically distributed manufacturing and manufacturing as a service.

Based on a strategic partnership of four leading Czech and German research institutions, its main goal is to establish the RICAIP centre, aiming to become a key entity in major European research infrastructures for advanced industry and production.

Results: RICAIP created an interconnected state-of-the-art infrastructure for research and development which enables rapid adaptation of production according to current customer needs or available production resources. The consortium has developed and demonstrated several case studies and demonstrators, offering companies flexible solutions which can be used in real industrial applications.

Application potential: The main impacts of the project are, in collaboration with the German partners, to increase the scientific capabilities of the Czech partners, enhancing their competitiveness and economic development in the long term, as well as improving research and innovation culture in the Czech Republic.

Contribution to mission and purpose of the evaluated unit: CIIRC CTU has developed its industrial testbed infrastructure with the latest technologies for Industry 4.0 thanks to a significant part of its EUR 27 million budget, enhancing its scientific environment and becoming an acknowledged and reliable partner in the community of distinguished European centres of excellence.

Role: Beneficiary (Partners: CEITEC BUT, DFKI (DE), ZeMA (DE))

Interdisciplinary aspects: Beyond research, RICAIP also provides support to SMEs, facilitating the transfer of technology and knowledge from academia to industry. RICAIP develops strong cooperation at the international level and addresses the current needs of society.

VISION: Value and Impact through Synergy, Interaction and Cooperation of Networks of AI Excellence Centres (EC, 2020-2024, budget: EUR 2,0 million)

Europe invests in the European model of human-centric AI, with a new set of European Networks of Excellence Centres in AI, Data and Robotics (NoEs) – AI4Media, ELISE, HumanE-AI-Net, TAILOR, from 2020 to 2024, ELSA, euROBIN, d AIEDGE, ELIAS, ENFIELD since 2023.

The VISION project (CSA) brought the European AI NoEs together to reinforce, interconnect and mobilise Europe's AI community, and to accelerate Europe's transition to a world-leading position in the research, development and deployment of AI technologies. VISION's objectives were to strengthen the synergies between NoEs, foster strong connections between academia and industry, develop a European approach to AI skills education, and promote the EU as an attractive environment for AI research.

Results: Various activities applied the objectives of the project e.g. Joint Ecosystem Mapping, Common visual identity for the European NoEs, AIDA/AI PhD curriculum, European AI Trend Radar, Joint SRA,

Workshops, ESSAI Summer School… Another key aspect was the facilitation of cross-NoE coordination and communication (7 Cross-NoE working groups established).

Application potential: N/A The project allowed the provision of practical, transferable learning opportunities for AI Ph.D. students, and the creation of a map of the organisations offering R&D&I activities on AI-related themes across Europe.

Contribution to mission and purpose of the evaluated unit: CIIRC's leading role in Communication and Dissemination and in related cross NoEs activities enabled to establish strong collaboration with leading European actors in AI.

Role: Participant (Beneficiary: University of Leiden (NL), Partners: DFKI, FBK, INRIA, Intellera, THALES, TNO, UCC)

Interdisciplinary aspects: Several activities had multi-sectoral aspects such as the academic-industry collaboration (TDWs, Trend radar), education programs (suitable for both technical and non-technical fields) etc.

euROBIN: European ROBotics and AI Network

(EC, 2022-2026, budget: EUR 12,5 million)

euROBIN comprises 31 partners across 14 countries, including the highest-profile research institutions and outstanding industrial partners across sectors.

This NoE brings together European expertise on Robotics and AI, establishing the first unified pan-European platform for research and development on AI-Based Robotics. The network is open to the entire robotics community and provides mechanisms of cascade funding to welcome new members.

Results: The main breakthroughs include significant scientific advances on core questions of AI-based robotics, as well as an integrative community platform designed to offer a centralized repository for sharing software modules, data, and expertise, strengthening the scientific robotics community in Europe.

Application potential: The main impact of euROBIN is bringing together the robotics community and to benefit science, industry, and society while promoting European values. The network is a facilitator of knowledge transfer and exchange between research institutions and industry partners. Its research agenda has the main goal to take a new and integrated perspective in designing the future ecosystem of heterogeneous intelligent machines interacting with humans.

Contribution to mission and purpose of the evaluated unit: The project provides an opportunity to test CIIRC CTU's research results in new high-impact applications in collaboration with some of the best robotics research labs in Europe. CIIRC CTU builds on its world-class results in robot perception (e.g. ERC AdG FRONTIER) and investigates its adaptation to new tasks in manufacturing or home robotics, using RICAIP Testbed Prague infrastructure.

Role: Participant (Beneficiary: DLR – German Aerospace Center (DE), Partners: INRIA, CEA and 27 others)

Interdisciplinary aspects: euROBIN research agenda focuses on 4 core scientific topics: intelligent and safe interaction with humans and the environment, learning transfer, transferable knowledge representations and human-centered robotics merging disciplines including mechanical/electrical engineering, computer science, mathematics and biology/biomechanics.

AI-MATTERS: AI MAnufacturing Testing and experimenTation network For EuRopean industrieS (EC, MPO, 2023-2027, budget: EUR 60,0 million)

The AI-MATTERS network connects 25 partners across 8 EU countries which all bring their unique expertise from various manufacturing sectors (automotive, circular economy, space and mobility, textile, material production).

Results: The network is developing world-class reference testing and experimentation facilities with a focus on advanced AI-based and AI-powered technologies in real-world scenarios for the manufacturing sector. Key areas include factory-level optimization, AI technology for autonomous decision making, collaborative robotics and circularity, offering also access to technology providers for the necessary expertise, professional services support on technical aspects of AI testing and access to the necessary digital infrastructure.

Application potential: AI-MATTERS aims at increasing the productivity, innovation capacity, resilience and global competitiveness of the European manufacturing sector through the integration of state-of-the-art AI and robotics technologies. AI-MATTERS overarching goal is to implement concrete steps to strengthen the implementation of human-centered AI systems in the EU. This makes it possible to solve and deploy robotics and other advanced technologies for the essential transformation of the production ecosystem in the EU.

Contribution to mission and purpose of the evaluated unit: CIIRC CTU has joined the AI MATTERS project to help enhance the competitiveness of small and medium enterprises in Central Europe, by providing them open access to its state-of-the-art RICAIP Testbed infrastructure as well as expertise for projects and services supporting the digital transformation of SMEs.

Role: Participant (Beneficiary: CEA (FR), Partners: CEITEC BUT, VŠB-TUO and 20 others)

Interdisciplinary aspects: The AI-MATTERS consortium brings diverse expertise for accelerating the uptake of AI, machine learning and AI-enabled robotics technologies in manufacturing, with a particular attention on circular economy.

ROBOPROX: Robotics and advanced industrial production

(MSMT, 2023-2028, budget: EUR 17,5 million)

The ROBOPROX project focuses on breakthrough research and development in robotics and advanced industrial manufacturing by leveraging flexible deployment of robots with a high degree of autonomy, safe collaboration with humans, control and optimization of manufacturing processes, and computational methods for manufacturing and materials engineering.

ROBOPROX will involve up to 180 top experts and offers dozens of new Ph.D. and postdoctoral positions and unique opportunities for talented scientists from the Czech Republic and abroad.

Results: Some of the expected results are 190 journal papers in Q1 WoS AIS or SJR, 130 conference papers in Core A/A* or Q2 in AIS or SJR, 20 applied results graded 1 or 2 in Methodology 17+.

Application potential: Cutting-edge research in this area will enable the development of more complex, modular and advanced solutions, and help increase the competitiveness of Czech industry. Various

applications in advanced industrial production with the aim of increasing productivity with help of robotics, automation, optimization algorithms, new materials.

Contribution to mission and purpose of the evaluated unit: CIIRC CTU will be able to pursue excellent research in the field of robotics and develop new approaches and technologies with an impact on industrial production, actively contributing to the transformation of the Czech industry and to the implementation of the priorities of the Innovation Strategy of the Czech Republic.

Role: Beneficiary (Partners: Brno University of Technology, University of West Bohemia in Pilsen, Technical University of Ostrava)

Interdisciplinary aspects: The project is interdisciplinary and promotes flexible development practices to meet changing customer requirements and to respect increasing environmental constraints.

Collaboration with other units of the evaluated HEI: Faculty of Electrical Engineering, Faculty of Mechanical Engineering, Faculty of Civil Engineering, Faculty of Information Technology, Institute of Experimental and Applied Physics at CTU.

Contract research: **Smart Counting Machines for Modular Industry 4.0 Packing Lines in LEGO** (2019–2024, budget: CZK 15,34 million)

The project focused on optimizing pre-pack packaging lines used in LEGO production. These lines utilize vibrating bowls to count and deliver LEGO bricks into individual packages. The correct parameter settings for these vibrating bowls are critical for production efficiency but require extensive training (6-12 months) for operators. The developed solution, called Virtual Operator, employs an IT architecture combining AI, EDGE, and Cloud technologies to automate and optimize the parameter settings dynamically.

Results:

- Implemented a Virtual Operator that uses AI-driven cluster analysis to determine optimal settings.
- Reduced manual adjustments needed from operators.
- Increased efficiency and reliability of the pre-pack production lines.
- Created a long-term, global knowledge base for settings optimization.
- Successfully integrated into LEGO production, proving its business case.

Application potential: The developed system can be adapted to various manufacturing industries requiring automated counting and packaging processes. The technology can be extended to other modular production environments needing high precision and quick adaptability.

Contribution to mission and purpose of the evaluated unit: The project aligns with LEGO's goal of innovation in manufacturing by leveraging digitalization and AI-driven automation to enhance efficiency, reduce labor dependency, and increase scalability. It also highlights the capabilities of Czech research institutions in developing cutting-edge industrial solutions.

Role: Beneficiary

Interdisciplinary Aspects: The project combined expertise from various fields, including industrial automation, artificial intelligence, IT architecture, and mechanical engineering, to create a highly efficient and adaptable solution.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary

Provider[25]	Project name	Support (in thousands CZK/EUR)[26]				
		2019	2020	2021	2022	2023
EC(BE)	AI4REASON: Artificial Intelligence for Large-Scale Computer-Assisted Reasoning (2015-2020)	38012,33/1499,5				
EC(BE)	RICAIP: Research and Innovation Centre on Advanced Industrial Production (2019-2026)	379900,55/14986,22				
GACR	Student Analyse (2018-2020)	4358/171,91				
MSMT	AI&Reasoning: Artificial Intelligence and Reasoning (2017-2023)	120945,96/4771,04				
MSMT	Cluster 4.0: Methodology of System Integration (2018-2023)	93767,45/3698,91				
MSMT	Delayed solution algorithms for future unmanned transport vehicles (2017-2019)	2022,5/79,78				
MSMT	IMPACT: Intelligent Machine Perception (2017-2023)	116487,42/4595,16				
MSMT	R4I: Robotics 4 Industry 4.0 (2017-2023)	145807,03/5751,76				
MSMT	RICAIP: Research and Innovation Centre on Advanced Industrial Production (2019-2024)	811092,45/31995,76				
MSMT	RobFyz: Enhancing Robotic Physiotherapeutic Treatments using Machine Learning (2019-2022)	661/26,07	1278/50,41	1905/75,15		
MV	Kassandra: Multi-camera vehicles' undercarriage security scanner (2017-2020)	5504/217,12				
TACR	CAK: Centre for Applied Cybernetics (2016-2019)	237818/9381,38				
TACR	ImitRob: Imitation learning supported by language for industrial robotics (2017-2019)	2539,97/100,2				
TACR	MAFRI: Transposition of MAF-type reliability indicators into the national reliability standards applicable in the corrective measures planning and evaluation in case of	3761,55/148,38				

[25] If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

[26] Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

	indication of generation inadequacy within the CZ grid (2018-2020)					
TACR	NCC CAI: National Centre of Competence – Cybernetics and Artificial Intelligence (2019-2022)	160000/6311,64				
GACR	PowerATP: Powering Automatic Theorem Provers by Machine Learning (2020-2022)		6547/258,26			
MSMT	POSTMAN: Powering SMT Solvers by Machine Learning (2020-2024)		38916,01/1535,15			
TACR	Pipetak: Automated robotic device for tube refilling during testing at COVID-19 (2020-2020)		887,5/35,01			
TACR	DiPreFE: Implementation of diagnostic and predictive maintenance for efficient control of photovoltaic powerplants using autonomous vehicles (2020-2024)		21662,5/854,54			
TACR	INUKEN: Development of technological unit for innovative energy storage using phase change of material (2020-2024)		17210/678,9			
TACR	Respirator: Commercialisation of the protective half mask with FFP3 security level (2020-2020)		1338,21/52,79			
GACR	MIRRACLE: Robot learning multimodal representation of actions in the context of Learning by demonstration (2021-2024)			7710/304,14		
MPO	VENT-CONNECT (2021-2022)			3600/142,01		
GACR	Scheduling Tests in Medical Laboratories: Reduction of Turn-Around Time (2022-2024)				7278/287,1	
HMP	Construction 4.0 - innovative technologies, automation and robotization of construction production (2022-2022)				496,46/19,58	
MSMT	prg.ai Master: Establishing new study programmes in progressive fields (2022-2023)				2214,4/87,35	

MZD	VentConnect2: CheckMyScreen: Optimising Human-Device Interaction and Improving Safety of Mechanical Ventilation by Innovative Autonomous Alert System: Randomised Controlled Cross-over Trial (2022-2025)				13211/521,14	
TACR	CERTICAR: Platform for certification of highly automated cars (2022-2025)				26779,04/1056,37	
TACR	Energy nest: Hybrid technolog complex providing Ancillary service for grid ballancing (2022-2023)				6835,69/269,65	
EC(BE)	DeeplsaHOL: Reinforcement learning to improve proof-automation in theorem proving (2023-2025)					4215,17/166,28
EC(BE)	EDIH CTU: EDIH Czech Technical University in Prague (2023-2025)					37502,77/1479,4
MPO	EDIH CTU: EDIH Czech Technical University in Prague (2023-2025)					37502,77/1479,4
EC(BE)	Ethical Engineer: Integrating teaching ethics in artificial intelligence and robotics (2023-2026)					10140/400
GACR	iCHORES: Intuitive Collaboration with Household Robots in Everyday Settings (2023-2025)					7234/285,36
GACR	UNI-3D: A Unified 3D Map Representation (2023-2027)					40073/1580,79
GACR	Urban Traffic Control by Means of Automated Planning (2023-2025)					6229/245,72
MSMT	ROBOPROX: Robotics and advanced industrial production (2023-2028)					444511,51/17534,97
TACR	Development and application of new linguistic content for Czech speech audiometry (2023-2026)					5834,47/230,16
Total		2122678.21/83734.84	87839.22/3465.06	13215/521.3	56814.59/2241.21	593242.69/23402.08
In the role of another participant						
Provider[27]	Project name	Support (in thousands CZK/EUR)				

[27] Ibid.

		year 1 2019	year 2 2020	year 3 2021	year 4 2022	year 5 2023
EC(BE)	ARROWHEAD: Arrowhead Tools for Engineering of Digitalisation Solutions (2019-2022)	7715,91/304,38				
EC(BE)	ARtwin: An AR cloud and digital twins solution for industry and contruction 4.0 (2019-2022)	9915,02/391,13				
EC(BE)	DIGICOR: Decentralised Agile Coordination Across Supply Chains (2016-2019)	11889,15/469				
EC(BE)	DISTINCT: Dementia: Intersectorial Strategy for Training and Innovation Network for Current Technology (2019-2023)	5953,99/234,87				
EC(BE)	SafeLog: Safe human-robot interaction in logistic applications for highly flexible warehouses (2018-2021)	17966,81/708,75				
EC(BE)	THERMAC: Thermal-aware Resource Management for Modern Computing Platforms in the Next Generation of Aircraft (2019-2022)	8878,84/350,25				
EC(BE)	UP-Drive: Automated Urban Parking and Driving (2016-2019)	19106,3/753,7				
EITD(BE)	DeepSpA: Deep Speech Analysis for Cognitive Assessment in Clinical Trials (2019-2019)	1521/60				
FFG(AT)	KnowDrift: Knowledge-Driven Industrial Robotics for Flexible Production (2017-2020)	554,13/21,86				
MPO	Collaborative robotic platform of the future (2019-2021)	1614,4/63,68	1991,88/78,58	1971,88/77,79		
MPO	FLOPP: Factory of the future (2017-2019)	6275,05/247,54				
MPO	GenomKit - Progressive technology for the rationalization of personalized pharmacogenomics, nutrigenomics and sports medicine (2018-2021)	4000/157,79				
MPO	HOPAX (2017-2019)	6750/266,27				
MPO	KONPOLA: Robotic cell for inspection of surface of painted uneven parts in the	2487,88/98,14				

	industrial manufacturing. (2017-2019)					
MPO	OZAS: Personal Health Assistance Systems (2017-2021)	3040/119,92				
MPO	PKPB: Supplementary platform PKPB (2019-2022)	2390/94,28	2390/94,28	2390/94,28		
MPO	Technology for industrial robots integration into production systems based on Industry 4.0 (2016-2019)	4981/196,49				
MPO	ZAJADOT: Research and realization of a testing robotic multi-wheel platform, with a focus on its centration and symmetrical passage through circular profiles of disposal boreholes for storage of disposal casks with SNF using multifunctional robotic technology (2018-2020)	3254/128,36				
MSMT	EERA-CZ 2: Enabling the participation of research organizations in the European Energy Research Alliance (EERA) (2019-2021)	331/13,06	625/24,65	562/22,17		
MV	Smart Camera - New Generation Monitoring Center (2017-2019)	4033/159,09				
MZD	Features of Electromechanical Dyssynchrony that Predict Effect of Cardiac Resynchronization Therapy (2015-2019)	5201/205,17				
TACR	CREOBOT: Research and realization of prototype of a breakthrough solution of multifunctional autonomous modular Creobot Modular for transport and manipulation in sophisticated manufacturing and assembly operations (2018-2020)	6750/266,27				
TACR	DAMias: Data-driven Asset Management in Automobile Industry Based on Semantic Modelling (2018-2019)	5807,2/229,08				
TACR	DC microgrid: DC Microgrid for apartment houses (2019-2022)	894,2/35,27	1553,2/61,27	1553,1/61,27	499,5/19,7	
TACR	Dflex: Proving usability of flexibility aggregation including demand side management for power	453,8/17,9	1201,9/47,41	1201,9/47,41	1097,2/43,28	

	system regulation purposes. (2019-2022)					
TACR	Energy Storage in Electricity Generation (2019-2023)	1068,03/42,13	1630,98/64,34	1832,49/72,29	1506,69/59,44	1449,99/57,2
TACR	HUMR: The use of humanoid robot for active ageing of older people (2019-2021)	763,56/30,12	763,56/30,12	763,56/30,12		
TACR	Ideas to Practice (2019-2021)	270/10,65				
TACR	MERKUR: Making a modern modular system for teaching mechatronics in line with the Industry 4.0 challenge (2018-2020)	2000/78,9				
TACR	MWPharmASIA - database extension of drug substances and their MWPharm models for East Asian population and development of NGS diagnostic panel and algorithm for predicting statin pharmacokinetics/dynamics (2018-2019)	2498,4/98,56				
TACR	Optimization of Dry Storage for Spent Nuclear Fuel (2019-2022)	570/22,49	1140/44,97	1140/44,97	1140/44,97	
TACR	SecureFlex: Secure power flexibility for grid control and market purposes (2018-2024)	13074,1/515,74				
TACR	VIREAS: Virtual Reality in Keeping the Elderly Active (2019-2022)	1280/50,49	1280/50,49	1280/50,49	120/4,73	
EC(BE)	BRAINE: Big data Processing and Artificial Intelligence at the Network Edge (2020-2023)		2118,31/83,56			
MSMT	BRAINE: Big data Processing and Artificial Intelligence at the Network Edge (2020-2023)		3934/155,19			
EC(BE)	DIH-World: Accelerating deployment and matureness of DIHs for the benefit of Digitisation of European SMEs (2020-2024)		1593,88/62,88			
EC(BE)	ELISE: European Learning and Intelligent Systems Excellence (2020-2024)		28360,31/1118,75			
EC(BE)	SPRING: Socially Pertinent Robots in Gerontological Healthcare (2020-2024)		17847/704,02			
EC(BE)	TAILOR: Foundations of Trustworthy AI - Integrating Reasoning, Learning and Optimization (2020-2024)		2615,99/103,2			

EC(BE)	VISION: Value and Impact through Synergy, Interaction and cooperation of Networks of AI Excellence Centres (2020-2024)		6622,69/261,25			
EITM(FR)	DigTrafoRis: Digital Transformation in RIS (2020-2020)		430,95/17			
EITM(FR)	EIT M RIS Hubs: EIT Manufacturing RIS Hubs (2020-2023)		1584,38/62,5	1590,71/62,75	1438,61/56,75	1422,14/56,1
EITM(FR)	LIFT Europe: LIFT European Network of Learning Factories (2020-2020)		269,34/10,63			
EITM(FR)	M-NEST-RIS: Network for Empowering People in Added-Value (2020-2020)		1774,5/70	760,5/30		
EITM(FR)	ManuLearn: Learning through manufacturing challenges II (2020-2021)		1584,38/62,5	735,15/29		
EITM(FR)	SMART4Custom: Smartphone app for customized COVID protective respirator mask (2020-2020)		79,22/3,13			
MZD	AgingEars: Novel diagnostic methods in examination of age related changes of the auditory system (2020-2023)		361/14,24	525/20,71	525/20,71	525/20,71
TACR	ROBWELD: Automatic robot welding of various plastic basins (2020-2022)		184,28/7,27	266,18/10,5	56,25/2,22	
TACR	SM4RT: Smart Metering 4 Regulators and Society (2020-2022)		442,62/17,46	1024,29/40,41	1033,29/40,76	
TACR	SynDevAI: Research and development of AI-enabled systemic control for automatic pilot preselection and screening (2020-2022)		2694,96/106,31	2694,96/106,31	2694,96/106,31	
TACR	VR Hotel: Application of virtual reality tools into the communication skills training of hotel workers for a purpose of reduction of concerns and risks associated with the spread of COVID-19 (2020-2022)		277,6/10,95	1166,95/46,03	869,28/34,29	
TACR	VRETCity: Exposure to stressful situations in a virtual city environment (2020-2023)		1361,36/53,7	1794,52/70,79	1803,36/71,14	1794,52/70,79
EC(BE)	COGNINTEL: Cognitive production based on intelligent Energy, Quality and Maintenance Management (2021-2022)			912,6/36		

EC(BE)	CSI-COP: Citizen Scientists Investigating Cookies and App GDPR compliance (2021-2024)			3412,74/134,63		
EC(BE)	DIH4AI: AI on-demand platform for regional interoperable Digital Innovation Hubs Network (2021-2023)			3663,08/144,5		
MPO	Sabris: Production management software in the context of Industry 4.0 (2021-2023)			7225,47/285,03		
EITM(FR)	AIMS2: AI for Manufacturing SMEs and Students (2021-2021)			1518,47/59,9		
EITM(FR)	EduDevRIS: Education programs development in RIS countries (2021-2022)			558,33/22,03	253,5/10	
EITM(FR)	RIS I4.0H: RIS Industry 4.0 Hubs (2021-2021)			1038,72/40,98		
EITM(FR)	SEEN for Lightweighting: Simulation Enhanced/Enabled Nuggets for Learning and Mastering Manufacturing for Lightweighting (2021-2022)			1463,96/57,75	306,13/12,08	
EITM(FR)	ShapiNG: Shaping the Next Generation of manufacturing professionals (2021-2023)			709,77/28	861,9/34	608,4/24
EITM(FR)	YML-TWO: Young Manufacturing Leaders - Talented Workforce for an Open society (2021-2023)			399,26/15,75	367,58/14,5	313,38/12,36
HMP	Alzheimer: Enjoyable Neuro Inspect (2021-2023)			3072,64/121,21		
HMP	IKAP 2 - Innovation in education (2021-2023)			13594,04/536,25		
MPO	TEPLATOR: Reactivity control system design (2021-2023)			7052,42/278,2		
TACR	AIDTWIGLOW: Autonomous Intelligent Digital Twin of the Globalized World: digital ontology for smart analytics, simulations, projections and decision-making (2021-2023)			529,24/20,88	700,4/27,63	33,08/1,3
TACR	Autonomous robotic system for ultrasonic and eddy current inspection of metal and composite parts of complex shapes (2021-2024)			12827,81/506,03		
TACR	Research and development of a robotic system for automated masonry from brick blocks (2021-2023)			4978,24/196,38	5024,14/198,19	2487,04/98,11

EC(BE)	AGIMUS: Next generation of AI-powered robotics for agile production (2022-2026)				23219,02/915,94	
EC(BE)	euROBIN: European ROBotics and AI NEtwork (2022-2026)				3461,85/136,56	
EITM(FR)	AMazED: Demand-driven additive manufacturing upskilling in RIS countries (2022-2022)				1394,25/55	
EITM(FR)	ConFacts: Multi-layer Connected Factories with hybrid conventional and digital components II (2022-2023)				1070,33/42,22	1131,62/44,64
EITM(FR)	Demo4Green: Green Manufacturing: Demonstrating technologies to fight Climate Change (2022-2022)				1128,08/44,5	
EITM(FR)	FactoRIS II: Learning Factories for Digital Transformation of SMEs II (2022-2022)				912,6/36	
EITM(FR)	RIEMANN: ROS-based Education of Advanced Motion Planning and Control (2022-2023)				1820,41/71,81	1850,55/73
EITM(FR)	Smart DIGI: Smart Educational Framework for DIGItalization (2022-2022)				960,13/37,88	
EITM(FR)	TXR-ATG: Telemotive Xtended Reality - Augmented Training and Guidance (2022-2022)				633,75/25	
EITU(ES)	IPA2X: Intelligent Pedestrian Assistant to Everyone (2022-2022)				7382,31/291,22	
MPO	Connected Motor Starter (2022-2023)				5098,29/201,12	
TACR	DECODIS: Load control in decentralised grid (2022-2024)				1805,13/71,21	
TACR	IHPSS: Intelligent Health Promotion Service System (2022-2025)				3909/154,2	
TACR	VERTIMOVE (2022-2023)				1960,5/77,34	2071,5/81,72
EC(BE)	AI REDGIO 5.0: Regions and (E)DIHs alliance for AI-at-the-Edge adoption by European Industry 5.0 Manufacturing SMEs (2023-2025)					2918,42/115,13
EC(BE)	AI-MATTERS: AI MAnufacturing Testing and experimenTation network For EuRopean industrieS (2023-2027)					69974,62/2760,34

MPO	AI-MATTERS: AI MAnufacturing Testing and experimenTation network For EuRopean industrieS (2023-2027)					69974,62/2760,34
EC(BE)	AIRISE: Artifical Intelligence in Manufacturing for Sustainability as SMEs (2023-2026)					6717,75/265
EC(BE)	CoreSense: A Hybrid Cognitive Architecture for Deep Understanding (2023-2026)					11312,44/446,25
EC(BE)	DigiCare4CE: Digital transformation of log-term care facilities for older people (2023-2025)					4258,8/168
EC(BE)	ELIAS: European Lighthouse of AI for Sustainability (2023-2027)					12110,96/477,75
EC(BE)	EXA4MIND: EXtreme Analytics for MINing Data spaces (2023-2025)					6907,88/272,5
EITM(FR)	AI4ENGINE: AI for weaving KPIs monitoring and prediction (2023-2024)					2535/100
EITM(FR)	RoboTwin – motion imitating robotics (2023-2023)					1283,34/50,63
GACR	MAPLE: Multi-Robotic Path Planning and Execution (2023-2025)					3837/151,36
MZD	NPH: A Complex Multi-layer Diagnostic Battery for NPH (2023-2026)					2844/112,19
TACR	Development of modular effector design system (2023-2024)					5687,5/224,36
TACR	MCX 5G terminal for critical communication for IRS and transport (2023-2025)					2306,45/90,98
TACR	RETEMED: Recombinant Technologies for Medicine (2023-2028)					8095,04/319,33
TACR	RoVozCi: Robotic pallet jack for bricks (2023-2025)					7073,88/279,05
TACR	STUFEDU: Social and motivational factors of study and their influence on study results in tertiary education with a focus on technical fields (2023-2025)					1500/59,17
Total		163287,8/6441,3	86713,3/3420,6	862010/3400,8	75053,4/2960,7	233025/9192,3

Other projects implemented at CTU, in which CIIRC participates as a contributor, based on CTU internal agreement						
Provider	Project name	Support (in thousands CZK/EUR)				
		year 1 2019	year 2 2020	year 3 2021	year 4 2022	year 5 2023
GACR	NOPEPA (2019-2023)	2975/117.36	3224/127.18	3294/129.94	3859.29/152.24	2330/91.91
GACR	NaoSkin: Robotic self-calibration and safe physical human-robot interaction inspired by body representations in primate brains (2017-2019)	417.5/16.47				
GACR	Temporal context in analysis of long-term non.stationary multidimensional signal (2017-2019)	647/25.52				
MPO	Control platform for high-precision assembly of microelectronic components (2017-2021)	4931.51/194.54				
MSMT	AT-Lab: Modernization and adaptation of laboratories in the field of assistive technologies (2018-2022)	291.21/11.49				
MSMT	AT-PhD: Assistive Technology for Sustainable Development and Active Life of Seniors and Handicapped Persons (2018-2022)	508.03/20.04				
MSMT	INAFYM: Engineering applications of microworld physics (2017-2022)	13507.85/532.85				
MSMT	International mobility of CTU researchers (2018-2021)	3703.52/146.1				
TACR	CANUT: Centre for Advanced Nuclear Technologies (2019-2019)	1513/59.68				
TACR	IPALM: Interactive Perception-Action-Learning for Modelling Objects (2019-2022)	452.44/17.85	603.25/23.8	603.25/23.8	150.81/5.95	
MSMT	HRAward: Capacity development for strategic research management at CTU in Prague (2020-2022)		278.46/10.98			
GACR	Active non-collocated vibration absorption for robots and mechanical structures (2021-2023)			2328/91.83	2544/100.36	2484/97.99
GACR	Novel concepts for analysis and design of nonlinear controllers and compensators of flexible and chained			353.3/13.94	353.3/13.94	353/13.93

	mechanical systems (2021-2023)					
MPO	DelPred: Database systems (2020-2022)			850/33.53		
MPO	Rotana: A new generation of machining tools made of advanced materials using laser technology in their production (2021-2022)			324.4/12.8	307.6/12.13	
EITM(FR)	FlexMan: Experiential Learning for Flexible and Resilient Manufacturing (2022-2023)				629.95/24.85	721.84/28.48
EC(BE)	PROBONO: The Integrator-centric approach for realising innovative energy efficient buildings in connected sustainable green neighbourhoods (2023-2024)					800/31.56
EITM(FR)	Self-Made: Self-management & device digitalization in manufacturing (2023-2024)					1307.07/51.56
GACR	Optimizing of distribution and orientation of the reinforcement using 3D printing technology in the ultra-high performance concrete (UHPC) (2023-2024)					4854/191.48
TACR	CANUT II: Centre for Advanced Nuclear Technologies II (2023-2028)					71400/2816.57
TACR	Chatbot UPV: Development of a communication assistant using artificial intelligence (2023-2024)					4525.37/178.52
TACR	FEFEFOV: Future strategies for environment friendliness of surface vehicles (2023-2025)					3786.32/149.36
TACR	Highly productive machines for digital factory environments (2023-2024)					1225/48.32
TACR	Material sustainability in additive manufacturing (2023-2023)					2012.5/79.39
Total		28947,06/1141,9	4105,71/161,96	7752,95/305,84	7844,95/309,47	95799,1/3779,06
Total as participant		192234,82/7583,23	90819/3582,6	93962,91/3706,63	82898,36/3270,16	328824/12971,36

Providers:

Provider acronym	Provider full name	Support (in thousands CZK/EUR)[28]				
		year 1	year 2	year 3	year 4	year 5
EC (BE)	European Commision	499338,89/19 697,79	59158,19/23 33,66	7988,42/315,13	26680,86/1052,5	166858,8/658 2,2
EITD (BE)	EIT Digital	1521/60				
EITM (FR)	EIT Manufacturing		5722.76/225. 75	8774.88/346.15	11777.21/464.58	11173.34/440 .76
EITU (ES)	EIT Urban Mobility				7382.31/291.22	
FFG (AT)	Austrian Research Promotion Agency	554.13/21.86				
GACR	Czech Science Foundation	8397.5/331.26	9771/385.44	13685.3/539.85	14034.59/553.63	67394/2658.5 4
HMP	Capital City of Prague			16666.68/657.4 6	496.46/19.58	
MPO	Ministry of Industry and Trade	39723.84/156 7.02	4381.88/172. 86	23414.16/923.6 4	5405.89/213.25	107477.39/42 39.74
MSMT	Ministry of Education, Youth and Sports	1309125.42/5 1642.03	45031.47/17 76.39	2467/97.32	2214.4/87.35	444511.51/17 534.97
MV	Ministry of the Interior	9537/376.21				
MZD	Ministry of Health	5201/205.17	361/14.24	525/20.71	13736/541.85	3369/132.9
TACR	Technology Agency of the Czech Republic	441514.25/17 416.74	54231.92/21 39.33	33656.48/1327. 67	57985.23/2287.39	121282.65/47 84.33
Total		2314913.03/9 1318.07	178658.22/7 047.66	107177.92/4227 .93	139712.95/5511.36	922066.69/36 373.44

Table 3.3.2 - Contract research activities

Client[29]	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
KM Robotics s.r.o.	Transfer of intellectual property	0/0	0/0	0/0	0/0	275/11
Národní vzdělávací fond, o. p. s.	SW processing for the needs of the STRATIN+ project	0/0	0/0	41/2	0/0	0/0
Rockwell Automation s.r.o.	Detailed design of discovery and security for SBDH, document the existing solutions of the "turbine restart problem", choose one solution for implementation into SBDH	1200/47	1200/47	1200/47	1200/47	1200/47

[28] Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

[29] If the client is from abroad, indicate in brackets the country of origin of the client.

GasNet, s.r.o.	Management and development of mathematical models and procedures	1000/39	1000/39	1000/39	1000/39	0/0
North Carolina State University Sponsored Programs (USA)	NCSU Subcontract No.: 2015-0098-01: project Fusion and Modeling Algorithms (FUMA)	4126/163	0/0	0/0	0/0	0/0
Magic Eye Inc. (USA)	Development of Calibration software for Magik Eye 3D sensor system, including creating depth map look up table.	275/11	281/11	258/10	0/0	0/0
Eaton Elektrotechnika s.r.o.	Laboratory Funding and Student Research Services Agreement	2000/79	2000/79	2000/79	2000/79	2000/79
CONCERTO AI (USA)	Invoice for work done as part of Joint Laboratory Agreement between Concerto AI Inc and CIIRC	2631/104	0/0	0/0	0/0	0/0
Magic Eye Inc.	Laboratory Funding and Student Research Services Agreement	328/13	160/6	280/11	300/12	200/8
Factorio Solutions, s.r.o.	Collaborative Research Agreement	568/22	800/32	600/24	600/24	600/24
POCKET VIRTUALITY a.s.	Based on the concluded Laboratory Funding and Student Research Services Agreement	260/10	500/20	520/21	162/6	0/0
WITS COMMERCIAL ENTERPRISE PTY LIMITED (ZAF)	Contract AHTR ESKOM RFP 4600052588, Study of salts and available metals, experimental testing of nitrate salts (melting behavior, conductivity and capacity), including data and report, experimental testing of feasible metals and their corrosion behavior including reports, preliminary design of the salt loop and interface with the He and steam loops. Incl. INI preparation & admission for RSA fellow and neutronics workshop, phase changing material feasibility study for the tanks.	1733/68	0/0	0/0	0/0	0/0
ADC Automotive Distance Control Systems GmbH (DEU)	Development Agreement - ADC Automotive Distance Control Systems GmbH	700/28	0/0	0/0	0/0	0/0
LEGO Production s.r.o.	Digital Prepack	373/15	0/0	0/0	0/0	0/0
ČEPS, a.s.	Analysis of the possibilities of using the energy DataHub in specific examples from the point of view of ČEPS (the Contracting Authority) - stage III. - preparation of the final study after incorporating comments	840/33	0/0	0/0	0/0	0/0
VOLKSWAGEN AG (DEU)	Project "Biosensorics", Research of the needs of the elderly drivers	2610/103	0/0	0/0	0/0	0/0
Huawei Technologies Duesseldorf GmbH (DEU)	Research and Development Agreement - HUAWEI TECHNOLOGIES Duesseldorf GmbH	3833/151	0/0	0/0	0/0	0/0
ROMEA, o.p.s.	Virtual reality of the camp in Lety u Písek from 1942 - 1943	826/33	0/0	0/0	0/0	0/0
LEGO Production s.r.o.	Pick&Place activities - robotic cell integrated conveyors system	890/35	0/0	0/0	0/0	0/0

ČEPS, a.s.	Study of the effect of changes in the production mix of the Czech Republic on the behavior of EC CR reliability standards	590/23	0/0	0/0	0/0	0/0
ČEPS, a.s.	Study of the effect of changes in the production mix of the Czech Republic on the behavior of EC CR reliability standards	800/32	0/0	0/0	0/0	0/0
LEGO Production s.r.o.	CTU CIIRC Talking LEGO characters development	510/20	0/0	0/0	0/0	0/0
Porsche Engineering Services, s.r.o.	Simulation in the TSN project 02 - 06/2019, Assist Motion Planner, Panamera - autonomous slalom, Simulation in OMNET++ (TSN project)	1751/69	0/0	0/0	0/0	0/0
ŠKODA AUTO a.s.	Smart Assistant - fast prototype	3310/131	0/0	0/0	0/0	0/0
LEGO Production s.r.o.	Digital model of Prepack component, Smart CM Next Steps, Smart CM Pilot, SMC - support	4000/158	5120/202	1840/73	1900/75	2 475/98
ŠKODA AUTO a.s.	FAS/ADAS for special groups of drivers, Motion Sickness, HMI for external communication - experimental studies, Innovative practices for assessing customer clinics, Implementation system design for data security within communication, Validation of Neteera measuring equipment	4914/194	3433/135	7103/280	5804/229	4 743/187
Airbus Defence and Space GmbH (DEU)	ooocMBSE consulting CTU	1276/50	0/0	0/0	0/0	0/0
Digiteq Automotive s.r.o.	Simulator PDC/PLA Sensors 3 pcs	114/4	0/0	0/0	0/0	0/0
ČEPS, a.s.	Calculation of balance limits for the maximum possible installed power of renewable sources for the EC CR for 2020	200/8	0/0	0/0	0/0	0/0
Česká zbrojovka Partners SE	Analysis of development in the field of Industry 4.0 and the concept of the CZ USA digital twin	174/7	411/16	0/0	0/0	0/0
CARDAM s.r.o.	Feasibility study - Optical detection of barrel curvature	242/10	0/0	0/0	0/0	0/0
ŠKODA AUTO a.s	Project: TP - optimization of the layout of production hall	240/9	0/0	0/0	0/0	0/0
LEGO Production s.r.o.	LEGO Adaptive Final Pack - Automatization, Digitalisation program (Mapping of current material, process, info flow and describe future state. Define gap analysis and create roadmap	1025/40	0/0	0/0	0/0	0/0
ŠKODA AUTO a.s.	Development of PDC/PLA sensor simulation	180/7	0/0	0/0	0/0	0/0
Slovenská elektrizačná prenosová sústava, a.s.	Study "Determining the maximum values of the installed power of electricity production equipment connected to the ES SR in 2021 with regard to resource adequacy"	662/26	226/9	0/0	0/0	0/0
Slovenská elektrizačná prenosová sústava, a.s.	Optimization of the ES SR model in the UPLAN software environment	151/6	31/1	0/0	0/0	0/0
Digiteq Automotive s.r.o.	Simulator of PDC/PLA sensors	190/7	0/0	0/0	0/0	0/0

Medicalc software s.r.o.	Contract research service in the form of development and implementation of control mechanisms of clinical data, execution of control imports, testing and debugging service.	300/12	0/0	0/0	0/0	0/0
ŠKODA AUTO a.s.	Project "Bin Picking - Implementation of the 3rd phase of Bin Picking at the welding plant	1911/75	0/0	0/0	0/0	0/0
Euroforum Group,a.s.	Consulting activities in the field of Industry 4.0 and digital transformation	300/12	0/0	0/0	0/0	0/0
Cargotec Oyj (FIN)	Project Sway2	281/11	287/11	0/0	0/0	0/0
LEGO Production s.r.o.	Pick&Place on semi-automatic line	666/26		0/0	0/0	0/0
ŠKODA AUTO a.s.	Analysis of costs associated with collisions	1530/60		0/0	0/0	0/0
Středočeský kraj	Elaboration of the concept "Cities of the future in the territory of BVVP Milovice - Mladá"	0/0	826/33	0/0	0/0	0/0
ŠKODA AUTO a.s.	Control unit for opening trunk doors using ultrasonic sensors	0/0	240/9	0/0	0/0	0/0
PREdistribuce, a.s.	Analysis of the benefits and risks of the AMM concept and the architecture using SEGW	0/0	324/13	0/0	0/0	0/0
E.nest Energy a.s.	Drafting and creation of a techno-economic platform for modeling operating revenues and costs of a combined energy source (gas turbine and battery storage) in different operating modes.	0/0	250/10	0/0	0/0	0/0
Univerzita Karlova	Expansion with the multiplayer function	0/0	577/23		362/14	
The Greenest Company s.r.o.	AI consulting services	0/0	499/20	0/0	0/0	0/0
Porsche Engineering Services, s.r.o.	Integration of ADAS functions into the autonomous vehicle demonstrator, Work on the integration of ADAS functions into the demo	0/0	4274/50	0/0	0/0	0/0
Středočeské inovační centrum, spolek	Verification study for the location of the World of Rescuers in the area of the area owned by the Central Bohemian Region of Vrchbělá	0/0	100/4	0/0	0/0	0/0
Digiteq Automotive s.r.o.	RDK simulator with modified FW	0/0	11/0	18/1	0/0	0/0
MĚSTSKÁ ČÁST PRAHA 6	Creation and display of a 3D visualization of the statue of Maria Theresa with the immediate surroundings of the statue and people related to the realization with subsequent display in the web interface on a computer, tablet and phone, including audio recordings about Maria Theresa and the statue	0/0	199/8	0/0	0/0	0/0
JettyRobot s.r.o.	Development work for a mobile crawler robot	0/0	6/0	1132/45	0/0	0/0
ŠKODA AUTO a.s.	Automatic generation of voice instructions for operation	0/0	0/0	1445/57	0/0	0/0

Vysoká škola chemicko-technologická v Praze	Analysis of modern methods applied in the teaching of chemical disciplines	0/0	41/2	0/0	0/0	0/0
INAPA s.r.o.	Analysis of sensor usage for real-time production monitoring	0/0	120/5	0/0	0/0	0/0
LEGO Production s.r.o.	Validation of the "bin picking" concept for paper	0/0	4100/43	0/0	0/0	0/0
VarioTec s.r.o.	Creation of a 3D model of the ignition chamber for the conversion of a diesel engine to CNG drive	0/0	150/6	0/0	0/0	0/0
BIOKYB s.r.o.	Contract research and development services related to the preparation of communication interfaces and a service SW kit based on the HL7FHIR communication standard, especially FHIR Client and Server, FHIR DSTU 2 model for testing purposes in telemedicine.	0/0	385/15	0/0	0/0	0/0
JettyVision s.r.o.	Supply of technical analysis and technical report for mobile crawler robot	0/0	100/4	0/0	0/0	0/0
ŠKODA AUTO a.s.	Unit for opening trunk doors using ultrasonic sensors, Simulation of signals for car sensors, Extended simulation of Bosch UZS sensors	0/0	0/0	2813/111	0/0	0/0
NUVIA a.s.	Development of a server-terminal application for the purpose of managing data, users and already available applications for the operation of laboratory no. 101 in building TR24 including a communication channel with a particle accelerator to ensure the safety of operators and instruments.	0/0	0/0	380/15	0/0	0/0
Beckman Coulter Česká republika s.r.o.	Processing and interpretation of laboratory data, Description of the process of processing laboratory samples with the DxA 5000 system and development of a tool for simulating laboratory operations with these systems	0/0	0/0	20/1	0/0	115/5
LEGO Production s.r.o.	Measurement of the sound pressure level of the packaging line	0/0	0/0	75/3	0/0	0/0
LEGO Production s.r.o.	Noise reduction design - Payment 2 - After the report is made	0/0	0/0	550/22	0/0	0/0
VALEO AUTOKLIMATIZACE k.s.	2021_02_ČVUT_ CIIRC_medusa service	0/0	0/0	260/10	0/0	0/0
Argotech a.s.	Image capture, beam detection and calibration points 1a + 1b of the offer - document Technical specification dated 21.01.2021, Determining the focus point	0/0	0/0	73/3	158/6	0/0
Porsche Engineering Services, s.r.o.	NanoRadar demo, RUR, ROS project externals	0/0	0/0	2213/87	0/0	0/0
O2 Czech Republic a.s.	Measurement and regulation project	0/0	0/0	289/11	0/0	0/0

ČEPS, a.s.	Advisory support in determining the conditions for connecting renewable resources	0/0	0/0	438/17	0/0	0/0
PPL CZ s.r.o.	Simulation of parcel transport operations	0/0	0/0	680/27	0/0	0/0
PREdistribuce, a.s.	Validation of the functional and technical parameters of the AMM infrastructure from the point of view of future PDS tasks	0/0	0/0	264/10	0/0	0/0
EG.D, a.s.	Design of the DLMS/COSEM data model for the definition of the communication interface between HES and electricity meters	0/0	0/0	330/13	0/0	0/0
DEKONTA, a.s.	Development of SW for automated processing of visual information about the rock environment	0/0	0/0	200/8	200/8	100/4
VALEO AUTOKLIMATIZACE k.s.	the Medusa project, Project: Preannotation	0/0	0/0	1423/56	0/0	0/0
Digiteq Automotive s.r.o.	Data Acquisition by LiDAR and Camera System	0/0	0/0	740/29	0/0	0/0
Airbus Defence and Space GmbH (DEU)	DISM WP2 - Reasoning on industrial system ontology	0/0	0/0	763/30	740/29	0/0
Beckman Coulter Česká republika s.r.o.	Data analysis, Tools for simulating laboratory operations in the DxA 5000 Fit system	0/0	0/0	200/8	190/7	0/0
Teplárna Otrokovice a.s.	Heating plant study	0/0	0/0	110/4	0/0	0/0
BIOKYB s.r.o.	Testing of test samples and verification of technical parameters of the system for telerehabilitation	0/0	0/0	245/10	0/0	0/0
LEGO Production s.r.o.	Noise measurement for CE platform PP99 and control noise measurement	0/0	0/0	0/0	209/8	0/0
CertiCon a.s.	Analysis, revision	0/0	0/0	0/0	2000/79	0/0
Porsche Engineering Services, s.r.o.	Machine learning, Jupiter - externists	0/0	0/0	0/0	1996/79	0/0
Teplárna Otrokovice a.s.	"Analysis of the applicability of TEPLÁTOR in the location of Otrokovice with regard to existing technologies and low required performance"	0/0	0/0	0/0	192/8	0/0
O2 Czech Republic a.s.	Measurement and regulation project, Measuring the speed of 5G mobile networks in Prague and Moravia	0/0	0/0	0/0	789/31	700/28
ZTS - výskum a vývoj, a.s.	"Regeneration of used batteries from electric cars", project code: 313012BUN5	0/0	0/0	0/0	4825/190	1 975/78
ŠKODA AUTO a.s.	Unit for opening the trunk door using UZ sensors - extension and route planning with recharging of the electric car	0/0	0/0	0/0	376/15	0/0
JettyVision s.r.o.	Belt development	0/0	0/0	0/0	80/3	0/0
Invest & Property Consulting, a.s.	Accumulation of energy from photovoltaic panels for the multifunctional house in Strašnice	0/0	0/0	0/0	140/6	0/0

LEGO Production s.r.o.	Offer for Energy Awareness - in Prepack - Phase 1, Energy-Awareness in Prepack Lines - Phase 2	0/0	0/0	0/0	584/23	563/22
Digiteq Automotive s.r.o.	Vision performance improvements in challenging scenarios of the eSmart project, CTU 3D Vision and image processing support	0/0	0/0	0/0	116/5	186/7
ŠKODA AUTO a.s.	Design and implementation of a system prototype, Estimation of the complexity of variants of planning parts, Offer for the design and implementation of methods	0/0	0/0	0/0	1270/50	573/23
ŠKODA AUTO a.s.	Offer for design and verification of functionality, Design and implementation of a system prototype for creation	0/0	0/0	0/0	573/23	1 188/47
Continental Automotive Czech Republic s.r.o.	Study on the optimization of robotic lines	0/0	0/0	0/0	0/0	173/7
TRIX Connections, s.r.o.	Validation of an intersection control model with two AGVs in the Testbed	0/0	0/0	0/0	320/13	0/0
Continental Automotive Czech Republic s.r.o.	End to end simulations CIIRC feasibility	0/0	0/0	0/0	625/25	0/0
Lumena s.r.o.	Development of an LED micrometer	0/0	0/0	0/0	18/1	18/1
Plzeňský Prazdroj, a. s.	CIIRC water and CO2 measurement project	0/0	0/0	0/0	500/20	78/3
EZconn Czech a.s.	Laser module edge detection	0/0	0/0	0/0	0/0	124/5
DEL a.s.	Based on your order no. 4500099556 We invoice you for processing CTU CIIRC - documentation	0/0	0/0	0/0	0/0	28 518/1 125
Porsche Engineering Services, s.r.o.	Order named "Externist", Order named "CIIRC Jiří Vlasák hourly billing", Jupiter Data Analytics in Q3	0/0	0/0	0/0	0/0	1 793/71
T-Mobile Czech Republic a.s.	Cooperation on order no. 4808134653, consulting services for Chatbot development needs for T-Mobile	0/0	0/0	0/0	0/0	330/13
LEGO Production s.r.o.	Control noise measurement	0/0	0/0	0/0	0/0	303/12
Porsche Engineering Services, s.r.o.	Job named "Externist"	0/0	0/0	0/0	0/0	624/25
ŠKODA AUTO a.s.	Virtual environment for simulations	0/0	0/0	0/0	0/0	466/18
Airbus Defence and Space GmbH (DEU)	Benchmarking Barrels "Variant generation and optimization"	0/0	0/0	0/0	0/0	245/10
Zentiva, k.s.	Cooperation in the field of development of intelligent conversational means	0/0	0/0	0/0	0/0	225/9
TP Holding, a.s.	Consultation - analysis of the problem and solution of optical quality control of plastic products	30/1	0/0	0/0	0/0	0/0
Klub přátel školy, Havířov-Prostřední Suchá, z.s.	MISS RENETA 2019 Virtual transformations and filming from a VR environment	48/2	0/0	0/0	0/0	0/0
CIEE Auxiliary Prague, zahraniční pobočný spolek	Organizing virtual reality courses	16/1	0/0	0/0	0/0	0/0
ČEPS, a.s.	Provision of service services for the month of May 2024 outside the period of increased support	242/10	110/4	96/4	222/9	904/36

Compo Tech PLUS, spol. s r. o.	Consultation on the development of a robot for winding carbon fiber on a horizontal mandrel	0/0	3/0	27/1	0/0	0/0
Královéhradecký kraj	Training on the topic of digitization of teaching using online tools for teachers and students	0/0	93/4		0/0	0/0
Man Truck and Bus, SE	SW license	0/0	0/0	811/32	0/0	0/0
Foxconn Technology CZ s.r.o.	Expert opinion on the system of mobile robots	0/0	0/0	92/4	0/0	0/0
Argotech a.s.	Analysis of X-RAY images for the detection of voids in a solder joint	0/0	0/0	5/0	0/0	0/0
SLAVATA INTECH, s.r.o.	Consulting and consulting activities in the field of robotics	0/0	0/0	300/12	0/0	0/0
BIOKYB s.r.o.	Grant of license - utility model no. 34862	0/0	0/0	350/14	0/0	0/0
Garrett Motion Czech Republic s.r.o.	Consulting services - RTOS	0/0	0/0	150/6	0/0	0/0
ŠKODA AUTO a.s.	Agreement on the financing of a joint workplace	0/0	0/0	41/2	486/19	486/19
ADOBE INC. (USA)	Consulting work on Research on Video Understanding, Tech Transfers into Related Products, and Advising on Recruiting, to be performed solely by Professor Josef Sivic	0/0	0/0	0/0	1807/71	2 036/80
ROHDE & SCHWARZ závod Vimperk, s.r.o.	Cooperation with the company ROHDE & SCHWARZ	0/0	0/0	0/0	0/0	60/2
ČEZ, a.s.	Analysis carried out according to contract no. 4102662502, IsppRustLink SW module development	0/0	0/0	0/0	0/0	399/16
Eaton Elektrotechnika s.r.o.	Provision of commercial use of part no. 4 and 5 results of the project "Flexible AC/DC microgrid for apartment buildings" number TK02020005	0/0	0/0	0/0	0/0	232/9
TRIX Connections, s.r.o.	Prototype 5G IoT Gateway device	0/0	0/0	0/0	0/0	784/31
TRIX Connections, s.r.o.	CTU CIIRC - development of a material flow simulation model	0/0	0/0	0/0	0/0	890/35
Národní centrum kompetence – multiple beneficiaries	CNC machining, prototyping, testing, optimization of machining processes	883/35	947/37	1079/43	924/36	956/38
Centrum města budoucnosti multiple beneficiaries	Services of the Centre of City of the future	584/23	402/16	177/7	262/10	206/8
Consultations, projects - multiple beneficiaries	Consultations, analyses, studies	255/10	180/7	43/2	475/19	75/3
Národní centrum Průmyslu - multiple beneficiaries	Services of the National Center for Industry 4.0	3898/154	4136/163	4113/162	4757/188	6 947/274
Národní centrum Průmyslu multiple beneficiaries	Digital audit services - National Center for Industry 4.0	0/0	0/0	60/2	0/0	0/0
Národní centrum Stavebnictví - multiple beneficiaries	Services of the National Center for Construction 4.0	0/0	0/0	0/0	2500/99	2 507/99

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the evaluated period, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts[30], on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

Self-assessment:

CIIRC CTU has selected the following 10 research results with a considerable impact on society:

1. Automated driving of Porsche Panamera
2. Second-life Batteries (Collaboration with ZTS - VÝSKUM A VÝVOJ, a.s.)
3. Rockwell Automation
4. Scheduling Algorithms for Time-Sensitive Networking (for Huawei)
5. Foot-activated Opening of the Fifth Door Using Machine Learning and Ultrasonic Sensors (for Škoda Auto)
6. Method for an accurate automated non-invasive measurement of blood pressure waveform and apparatus to carry out the same (Patent US10251567. 2019-04-09)
7. Prototype of robotic arm “Pipeťák”
8. TEPLATOR: District heating source utilizing irradiated nuclear fuel
9. VENT-CONNECT: Machine Learning-Based System for Remote Monitoring in Intensive Care Units
10. DigiAudit: Technologically independent tool for Digital Maturity Assessment

Automated driving of Porsche Panamera

Reference to project (3.3.1/3.3.2): Simulation in the TSN project 02 - 06/2019, Assist Motion Planner, Panamera - autonomous slalom, Simulation in OMNET++ (TSN project)

The Porsche Panamera Automated Driving system is an advanced solution for automated car functionality, focusing on slalom maneuver trajectory planning around traffic cones. Using optimization techniques and Logic-Based Benders Decomposition, it plans the car’s path. The system relies on sensors such as a monocular camera, LiDAR, and differential GPS to detect cones and position the car precisely in real-time. Executed on the NVIDIA TX2 platform, the system integrates with the car's Electronic Control Units via CAN and FlexRay buses, ensuring smooth control during high-performance maneuvers, like U-turns and lane changes.

Impacts on Society: The system advances autonomous driving technology, improving safety and performance on the road. It reduces dependence on human drivers for repetitive tasks like car testing, making the process more efficient and less error prone. Automated testing fosters innovation in car development, leading to safer, more reliable vehicles.

Use of results: The trajectory planning system is integrated into the Porsche Panamera to test the vehicle’s dynamics in various conditions. It also contributes to the development of driver assistance systems for other vehicles within the Volkswagen Group.

[30] See Terms definition.

Potential and factual users: Automotive manufacturers, R&D teams, and organizations focused on vehicle safety and automation are key users. Testing facilities and professional drivers evaluating vehicle performance also benefit from the system.
Measurable economic impacts: Automation in vehicle testing reduces manual testing costs and accelerates the development cycle, leading to faster time-to-market. The system has helped Porsche secure contracts with the Volkswagen Group and other companies, enhancing its competitive edge.
Gender dimension: Automated driving technologies offer opportunities for a more diverse workforce, encouraging women's participation in automotive engineering and technology.
Sustainability aspects: The system optimizes driving, reduces human intervention, and enhances testing efficiency, minimizing environmental impact and improving safety, leading to fewer accidents and resource waste.

Second-life Batteries (Collaboration with ZTS - VÝSKUM A VÝVOJ, a.s.)
Reference to overview of results (3.4.1): Virtual commissioning of a battery dismantling factory and visualisation of the process using virtual reality; Design, verification and optimization of battery transport options using AGVs
Reference to project (3.3.1/3.3.2): "Regeneration of used batteries from electric cars", project code: 313012BUN5

A collaborative effort between CIIRC and Slovak company ZTS - VÝSKUM A VÝVOJ, as part of the IPCEI framework, has led to the development of a sustainable solution for managing used electric vehicle (EV) batteries. As electric vehicle adoption grows, managing used EV batteries becomes more important. Typically, EV batteries are replaced when their capacity drops below 80%, but traditional recycling methods, such as crushing and smelting, do not allow to produce new batteries. The "Second-life Batteries" solution offers an alternative by evaluating individual battery modules' condition and repurposing them for secondary applications. This involves retrofitting with advanced automation and AI, providing reliable storage options and enhancing energy security and grid stability.
Impacts on Society: The project helps to address the environmental challenges of battery waste while supporting the transition to sustainable energy solutions. It reduces the need for new raw materials, cuts down on waste, and lowers the environmental impact of battery production.
Use of results: Repurposed batteries are used in stationary storage systems to support renewable energy integration, providing stable energy storage that contributes to grid stability and energy security.
Potential and factual users: Energy companies, renewable energy providers, and industries dependent on battery storage solutions are key users of the technology. It also benefits companies in the recycling and energy sectors.
Measurable economic impacts: Repurposing used batteries offers cost savings compared to producing new ones, promoting a circular economy in the energy sector. This approach can reduce production costs for industries relying on storage solutions.
Gender dimension: Neutral.
Sustainability aspects: The solution reduces the need for new raw materials and provides efficient storage solutions that aid renewable energy integration, supporting the transition to a low-carbon economy.

Rockwell Automation: Semantic Big Data Historian (SBDH)
Reference to project (3.3.1/3.3.2): Detailed design of discovery and security for SBDH, document the existing solutions of the "turbine restart problem", choose one solution for implementation into SBDH

Within the RA-DIC laboratory, SBDH was developed as an enabler of flexible production. It features a Plug&Play cyber-physical system (CPS) concept and Apache Spark for rapid data stream processing from

shop floor sensors. Current research focuses on using OPC UA discovery to enable Plug&Play deployment of SBDH as a cloud-CPS and for dashboarding.

Impacts on society: The research advances flexible and intelligent manufacturing by enabling Plug&Play CPS components. This helps industries adapt to changing demands, reducing downtime and improving efficiency. It supports Industry 4.0 by enhancing automation, interoperability, and data-driven decision-making, leading to job creation in high-tech fields and improved working conditions.

How the results are used: The Plug&Play CPS concept allows seamless device integration into production lines without manual configuration. Implemented in the RA-DIC lab, SBDH processes real-time sensor data using Apache Spark for fast data handling, optimizing processes, detecting faults, and improving performance.

Potential and factual users:

- **Manufacturers:** Benefit from automatic device integration and real-time data analysis.
- **Power Plants:** Tested on a hydroelectric plant to optimize turbine performance.
- **Automation Companies:** Used in smart factories and IoT-enabled systems.
- **Academia and Researchers:** Valuable for AI-driven industrial research and big data processing.

Measurable economic impacts:

- **Reduced downtime:** Automatic device discovery eliminates manual configuration delays.
- **Increased efficiency:** Real-time processing ensures quick fault detection.
- **Cost savings:** Automation minimizes manual labour, reducing operational costs.
- **Scalability benefits:** Smart manufacturing systems can expand without major reconfigurations.

Gender dimension: Neutral.

Sustainability aspects:

- **Energy efficiency:** Real-time monitoring reduces energy consumption.
- **Reduced resource waste:** Optimized scheduling minimizes material waste.
- **Sustainable Industry 4.0 practices:** Enhanced interoperability extends device lifespans and reduces electronic waste.

Scheduling Algorithms for Time-Sensitive Networking (for Huawei)

Reference to project (3.3.1/3.3.2): Research and Development Agreement - HUAWEI TECHNOLOGIES Duesseldorf GmbH

Time-Sensitive Networking (TSN) is a set of standards for time-sensitive data transmission over deterministic Ethernet. It enables converged networks with real-time Audio/Video Streaming and control streams used in automotive and industrial settings. To meet hard real-time requirements, TSN requires an algorithm to synthesize time-triggered message schedules. However, the standard does not include such an algorithm. Our work provides efficient, scheduling algorithms providing results compliant with TSN for safety applications demanding time determinism and high throughput, such as automated cars, robotics, and industrial control.

Impacts on Society: Reliable real-time communication is crucial for safety-critical applications like steer-by-wire, brake-by-wire, and other high-determinism control systems affecting daily life.

Use of results: The TSN scheduling algorithm (IEEE 802.1Qbv compliant) was tested and integrated by Huawei Munich, a leading TSN switch producer. They use it as a key component of their TSN network configuration tool. In tests, two TSN switches and an IXIA traffic generator enabled communication between one PLC and 13 actuators. We obtained US patent US20220021625.

Potential and factual users: Automotive and aerospace companies, device vendors, R&D teams, and organizations working on dependable systems.

Measurable economic impacts: Our algorithm enhances TSN efficiency by reducing bandwidth usage and end-to-end latency, lowering costs for building and operating devices. Direct revenue from this contract for CTU CIIRC was approximately 4M CZK.

Gender dimension: Deterministic real-time communication enables remote operation of machines, robotics, and virtual environments, supporting women and caregivers by providing remote work opportunities in traditionally on-site industries like manufacturing, healthcare, and engineering.
Sustainability: Efficient TSN scheduling reduces latency and congestion, improving data transmission efficiency. This lowers industrial energy consumption and enhances real-time coordination of decentralized energy sources.

Foot-activated Opening of the Fifth Door Using Machine Learning and Ultrasonic Sensors (for Škoda Auto)
Reference to project (3.3.1/3.3.2): Control unit for opening trunk doors using ultrasonic sensor;, Unit for opening trunk doors using ultrasonic sensors; Simulation of signals for car sensors, Extended simulation of Bosch UZS sensors; Unit for opening the trunk door using UZ sensors - extension and route planning with recharging of the electric car

Many cars allow opening the trunk door from outside by "kick" motion below the trunk. Currently, these systems use a capacitive sensor installed specifically for this purpose. For many reasons, these sensors are not reliable enough and increase vehicle cost. In cooperation with Škoda Auto, this work proposed, implemented and evaluated a solution which allows opening the door by reusing the ultrasonic sensors for parking assistants. Sufficient performance and reliability were achieved by using machine learning techniques. Specifically, we implemented hardware and software solutions that used the VGG-inspired Convolutional Neural Network architecture to distinguish the kick that should open the fifth door, from the other movements of people and objects behind the car.
Impacts on Society: The system showed that it is possible to decrease cost and increase reliability of a function present in many common cars. This will allow putting that function into more vehicles, including lower-class ones, simplifying the lives of more people. Increased functionality and lower costs will also help the European automotive sector in general.
Use of results: The system was delivered to Škoda Auto and was presented in technology fair in Wolfsburg (Volkswagen headquarters) with positive response. The results should be further developed internally by Škoda/VW development teams.
Potential and factual users: Automotive manufacturers, R&D teams, organizations focused on comfort vehicle functions.
Measurable economic impacts: Cost reduction from the replacement of capacitive sensors from vehicles with ultrasonic sensors already used for other purposes, by using more clever data processing algorithms, which are obviously cheaper to deploy than hardware sensors.
Gender dimension: Neutral, helping both genders perform common tasks.
Sustainability aspects: The system simplifies vehicles' mechanical design while providing better functionality. The lower number of mechanical parts has a positive effect on the environment in many phases, from vehicle manufacturing to its decommissioning and recycling.

Method for an accurate automated non-invasive measurement of blood pressure waveform and apparatus to carry out the same (Patent US10251567. 2019-04-09)
Reference to project: Apparatus for automatic analysis of blood pressure waveform and evaluating hemodynamic parameters of the cardiovascular system (MPO TRIO, 2016)

The patented method (US Patent No. 10251567 B2) enables accurate, automated, and non-invasive blood pressure waveform measurement, offering a safer alternative to traditional invasive catheter-based techniques. The system uses a cuff with at least two pressure sensors, including a differential pressure

sensor, to capture suprasystolic pressure pulsations. An electro pump inflates and deflates the cuff in a controlled manner, while a microprocessor filters signals, digitizes data, and calculates cardiovascular hemodynamic parameters. The device supports real-time monitoring and data transmission to external systems.

Positive Impacts on Society: This innovation improves cardiovascular diagnostics by providing a safer and more accessible method for monitoring blood pressure. It is particularly beneficial for elderly and high-risk individuals, enabling home-based monitoring and empowering patients to take control of their health. Early detection and management contribute to better patient outcomes and quality of life.

Use of results: The technology integrates with eHealth systems for real-time data transmission and remote monitoring by healthcare professionals. Validated in clinical studies, its accuracy matches invasive methods, making it a reliable tool for advanced cardiovascular diagnostics.

Potential and Factual Users:

- **Patients**: Especially those at high cardiovascular risk requiring frequent monitoring.
- **Clinicians**: Enhances cardiovascular assessment and disease management.
- **Researchers**: Provides a non-invasive method for cardiovascular studies.
- **Hospitals & Home Healthcare Providers**: Enables cost-effective, remote patient monitoring.

Measurable Economic Impacts: Reducing the need for expensive invasive procedures lowers healthcare costs. Supported by a **2M CZK grant (TACR Program Epsilon)**, the device's economic potential is recognized, fostering growth in the healthcare technology market.

Gender Dimension: The device is universally applicable, providing equal benefits regardless of gender. Its accessibility facilitates widespread use, overcoming barriers associated with clinic-based diagnostics.

Sustainability Aspects: Home-based monitoring minimizes hospital visits, reducing resource consumption and environmental impact, contributing to a more sustainable healthcare system.

Prototype of a robotic device "Pipeťák"

Reference to project (3.3.1/3.3.2): Pipetak: Automated robotic device for tube refilling during testing at COVID-19 (2020-2020); NCC CAI: National Centre of Competence – Cybernetics and Artificial Intelligence (2019-2022)

In March 2020, during the COVID-19 pandemic, CIIRC CTU developed an innovative robotic solution known as "Pipeťák" in just two weeks. Based on the KUKA LBR IIWA robot (€70k), this robotic station automated pipetting for COVID-19 testing, reducing manual workload and increasing efficiency. Pipeťák added the master mix - essential for virus detection - to patient samples, a task traditionally performed manually with high precision. Automating this process minimizes human error and accelerated testing. CIIRC teams, in partnership with other Czech institutions such as the Institute of Nuclear Physics (ÚJF) of the Czech Academy of Sciences, designed, built, and deployed the fully functional device. However, Pipeťák was a temporary solution. After nine months, hospitals acquired high-throughput machines, making it obsolete. It was then disassembled, and its parts returned to research.

Impacts on society: Pipeťák showcased the potential of scalable robotic solutions in healthcare, promoting sustainable approaches, and demonstrating rapid deployment and short-term scalability to manage crisis workloads.

Use of results: With the robot's assistance, the capacity of tested samples increased from dozens per day to approx. - 700 samples per day. Pipeťák alleviated the manual burden on laboratory staff, allowing them to focus on complex tasks.

Potential and factual users: The "Pipeťák" robotic station was deployed in Laboratory of Clinical Microbiology at Na Bulovce Hospital in Prague and used for nine months.

Measurable economic impacts: This solution contributes to laboratory efficiency, cost savings, and long-term benefits for healthcare automation. The automation reduced the hours required for manual testing, which requires skilled laboratory technicians.

Gender dimension: Designed for universal use, benefiting all individuals.
Sustainability aspects: Automating the pipetting process reduces the consumption of pipette tips and reagents, contributing to more sustainable laboratory practices. The ability of a research lab to provide a solution swiftly, outpacing commercial development, is sustainable.

TEPLATOR: District heating source utilising irradiated nuclear fuel
Reference to project (3.3.1/3.3.2): TEPLATOR: Reactivity control system design (2021-2023)

Description: Traditional nuclear reactors use only 5% of fuel energy, leaving 95% in spent assemblies. TEPLATOR, developed by CIIRC CTU in collaboration with FEE University of West Bohemia, offers an affordable heating alternative to coal and gas plants. It may use already irradiated nuclear fuel (within regulatory and design limits) from commercial light waterpower reactors. The concept was developed and patented in 2020.
Impacts on society: Producing no CO_2, TEPLATOR can upcycle spent nuclear fuel and generate heat more cheaply than burning coal or natural gas.
Use of results: The project's potential has attracted private investors, promising significant financial backing, and has garnered international interest, notably by the city of Slavutych in northern Ukraine.
Potential and factual users: The solution is particularly suitable for countries that have thousands of nuclear fuel assemblies stored either in intermediate storage or in spent fuel pools.
Measurable economic impacts: With an output of 50-150MW, the TEPLATOR can produce heat at a price of up to 4 EUR/GJ. The investment cost for the construction of the TEPLATOR plant is less than €30 million (2019 prices). Current Czech wholesale heat prices are 24-80 EUR/GJ. There are dozens of district heating networks in Czechia and hundreds in Europe.
Gender dimension: The device is designed for universal use, benefiting all individuals regardless of gender.
Sustainability aspects: The ability to reuse nuclear fuel, which is currently stored in secure intermediate storage facilities where there are about 20,000 spent assemblies in the Czech Republic, is unique. Independence and security of fuel supply are assured as TEPLATOR consumes only 55 fuel assemblies a year. By implementing the idea of energy storage into the TEPLATOR design, it can provide an uninterrupted supply of heat for medium to large cities.

VENT-CONNECT: Machine Learning-Based System for Remote Monitoring in Intensive Care Units
Reference to project (3.3.1/3.3.2): VentConnect2: CheckMyScreen: Optimising Human-Device Interaction and Improving Safety of Mechanical Ventilation by Innovative Autonomous Alert System: Randomised Controlled Cross-over Trial (2022-2025); VENT-CONNECT (2021-2022)

VENT-CONNECT is an advanced patient-ventilator asynchrony (PVA) detection system developed at CIIRC CTU in collaboration with FEE CTU and the 3rd Faculty of Medicine, Charles University. It enhances mechanical ventilation management by detecting and classifying PVAs in real-time directly from ventilator screen data. Using deep learning algorithms trained on expert-annotated breath waveforms, the system provides immediate alerts to clinicians, enabling timely intervention,something previously unavailable.
Impacts on society: VENT-CONNECT improves the quality of care at Intensive Care Units (ICU) by increasing patient safety via the reduction of complications related to mechanical ventilation, such as ventilator-induced lung injury and unnecessary sedation. Optimizing ventilator settings shortens ICU stays and enhances patient outcomes.
Use of results: The system delivers real-time alerts via a dedicated interface, notifying clinicians of significant PVAs and their severity. Integrated into ICU workflows, it aids healthcare providers in data-driven decision-making.

Potential and factual users: Designed for ICU clinicians, including intensivists, anesthesiologists, and nurses, VENT-CONNECT's user-friendly interface ensures accessibility for professionals with varying expertise in mechanical ventilation management.
Measurable economic impacts: By reducing ICU stay duration and mechanical ventilation dependence, VENT-CONNECT lowers hospital costs. It also minimizes alarm fatigue and streamlines workflows, improving operational efficiency and reducing staffing burdens in critical care.
Gender Dimension: The system applies universally to all mechanically ventilated patients, regardless of gender.
Sustainability aspects: VENT-CONNECT enhances ICU sustainability by optimizing ventilation management, reducing resource and medication consumption, and lowering the environmental footprint of prolonged ICU stays. Its integration into healthcare infrastructure supports long-term scalability and sustainability in critical care.

DigiAudit: Technologically independent tool for Digital Maturity Assessment
Reference to project (3.3.1/3.3.2): Digital audit services - National Center for Industry 4.0

DigiAudit is an innovative tool developed by the CIIRC team and delivered by NCI4.0 to assess and enhance the digital maturity of companies, particularly SMEs. It provides a comprehensive analysis of a company's digitalization status, identifying strengths and areas for improvement to support effective digital transformation.
The tool is available online for free, starting with a self-assessment evaluating the company from multiple dimensions such as organization, technology, and processes. After completing the online assessment, the company automatically receives a generated report containing a comprehensive evaluation of its level of digital maturity, a heatmap of development opportunities, and recommendations for key areas of further digitalization. Companies can then opt for expert consultations or an in-depth onsite investigation to align digital transformation with their specific needs. In 2022, the Czech Ministry of Industry and Trade approved DigiAudit as a mandatory attachment for applications under the Digital Enterprise National Recovery Plan, highlighting its credibility and adoption.
Impacts on society: DigiAudit helps companies navigate new technologies and define digital strategies, ensuring informed investment decisions and increased competitiveness.
Use of results: By 2023, a total of 312 entities had completed the DigiAudit. Aggregated participant data serves as a benchmark for assessing future DigiAudit participants and it is used in further analytical outputs such as the Analysis of Czech Industry or as content for professional conferences.
Potential and factual users: Manufacturing SMEs aiming to digitize but facing financial and technological barriers.
Measurable economic impacts: DigiAudit helps companies in their competitiveness, sustainability and efficiency, avoiding unnecessary investments and fostering job creation in the digital sector.
Gender dimension: The tool is designed to be universally applicable, serving all companies regardless of the gender composition of their workforce.
Sustainability aspects: Digital transformation facilitated by DigiAudit can lead to the development of new, sustainable business models alongside efficiency.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result[31]	Year of application	Name
Software	2019	Automated driving of Porsche Panamera Authors: Záhora, J.; Sojka, M.; Hanzálek, Z.
Functional Samples	2023	Virtual commissioning of a battery dismantling factory and visualisation of the process using virtual reality; Authors: Jochman, T.; Souček, J.; Štefan, J.; Strakošová, S.; Šustr, V.; Burget, P. Design, verification and optimization of battery transport options using AGVs Authors: Dvořák, F.; Jochman, T.; Burget, P. et al.
Article/Conference paper Article/Conference paper	2019 2020	Rockwell Automation Information Exchange and Integration Within Industrial Automation Domain Authors: Jirkovský V.; Obitko M.; Kadera P. Requirements for Information Modelling in Manufacturing Authors: Jirkovský V.; Obitko M.; Šebek O.; Kadera P.
ASW - Software	2019	Scheduling Algorithms for Time-Sensitive Networking Authors: Vlk, M.; Brejchová, K.; Hanzálek, Z.
Software	2021	Foot-activated Opening of the Fifth Door Using Machine Learning and Ultrasonic Sensors Authors: Bouška, M.; Procházka, T.; Sojka, M.; Hanzálek, Z.
Patent	2019	Method for an accurate automated non-invasive measurement of blood pressure waveform and apparatus to carry out the same (Patent US10251567. 2019-04-09) Authors: Fabián, V.; Křemen, V.; Dobiáš, M.
Prototype	2020	Prototype of robotic arm “Pipeťák” Authors: Smutný, V.; Hlaváč, V.; Krsek, P.; Seifert, D.; Uller, M.; Běhal, R.; Mík, A.; Sejkot, R.
Utility Model Utility Model Proceedings Paper Article Article	2023 2023 2023 2023 2022	A system for controlling the reactivity of small modular reactors by changing the moderator level (Czechia. Utility Model CZ 37070. 2023-05-23) Authors: Kořínek, T.; Lovecký, M.; Škarohlíd, J.; Škoda, R.; Vilímová, E. A mechanical reactivity control system for small modular reactors (Czechia. Utility Model CZ 37149. 2023-06-23) Authors: Hartman, P.; Zuda, M.; Jochman, T.; Kořínek, T.; Lovecký, M.; Peltan, T.; Škoda, R.; Vilímová, E. et al. A Study of Integration of Liquid Air Energy Storage (LAES) Technology to Nuclear District Heating Facility Teplator; Škarohlíd, J.; Burian, O.; Škoda, R.; Abushamah, H.A.S. Design and Operation Optimization of a Nuclear Heat-Driven District Cooling System Authors: Abushamah, H.A.S., Burian, O., Škoda, R. Nuclear energy for district cooling systems – Novel approach and its eco-environmental assessment method; Authors: Saleh Abushamah, H.A., Škoda, R.
Utility model	2022	VENT-CONNECT: Machine Learning-Based System for Remote Monitoring in Intensive Care Units: Monitoring system for observing the patient's health status, Czechia. Utility Model CZ 36317. 2022-08-30. Authors: Vysloužilová, L.; Macík, M.; Samek, M.; Kubr, J.
Other Methodology (not meeting RIV conditions)	2021	DigiAudit: Technologically independent tool for Digital Maturity Assessment

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

[31] Specify the specific type of result. Add rows as needed.

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)[32], providing a brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).[33]

Additionally, the evaluated unit shall briefly comment on the funds received during the evaluation period from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided on the annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization. – 5 examples

Self-assessment:

CIIRC CTU effectively transforms its research results into practical applications by establishing strong collaborations with a **diverse range of users**, which can be categorized as follows:

1. **By type of deployment**: Both **technology providers** integrating advanced solutions into their products and services to enhance their competitive edge, and **end users** optimizing operations, improving efficiency, and driving digital transformation.
2. **By size:** Organizations of **all sizes**, from start-ups and small to medium-sized enterprises (SMEs) to large corporations. Also, individuals, including professionals, staff, and the general public.
3. **By sector:** The **private/commercial sector**, including industries such as the automotive, aerospace, manufacturing, construction, logistics, healthcare etc., as well as the **public sector**, encompassing administration, universities, research institutions, professional associations and networks.
4. **By geographical scope:** Entities acting on local, national, European, international and global levels.

Through these collaborations and the broader range of users - including industry, academia, public institutions, civil society, and the general public - CIIRC CTU successfully bridges the gap between research and practical application, fostering innovation across multiple domains.

Methods for seeking new users:

1. **Direct and indirect marketing** through online (website, newsletters, social media etc.) and offline tools.
2. **Participation at fairs & events:** CIIRC's teams showcase their expertise and outcomes at the most relevant events in the field, summits and conferences.
3. **Organizing events, incl. hands-on workshops, training and Open Days** to attract both professionals and the general public.
4. **Customized user stories and best practices** to attract new clients – accelerated also thanks to CIIRC's key role as a solution provider through EDIH and TEF EU-supported schemes.
5. **Project and scientific dissemination**

Methods of commercialization of R&D&I results:

[32] In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.
[33] If the commercialisation of R&D&I results is carried out in this way.

1. **Collaborative research with the potential for commercialization**
   Around 75% of external CIIRC's industrial funding comes from collaborative research, often supported by public funding sources such as the Technology Agency of the Czech Republic and EU programs.
2. **Contract research**
   An efficient transfer method, particularly in long-term collaborations where companies sign repeated one-year contracts.
3. **Joint Research Labs**
   Establishing joint research labs with industry partners such as Škoda Auto, Rockwell Automation, and Eaton ensures sustained funding and allows for the ongoing development of advanced technologies.
4. **Start-up/spin-off**
   Several start-ups that originated at CIIRC (Trix Connections, Prometheus) collaborate on research and commercialization, even often without direct CTU ownership. Spin-offs involving CTU shares are now being established thanks to newly implemented legislative norms and enhanced support from the university.
5. **Licensing of the IPR**
   While software licensing remains complex in the Czech Republic, CIIRC has successfully negotiated a few high-value agreements despite the demanding process leading on that (e.g. 8M CZK deal with Wienerberger requiring legal support and involvement of the CEO in Vienna in 2024/2025).

CIIRC secures non-public funding mainly through industrial contracts and licensing agreements. For example, consultation and pilot studies for the eRobot project generated revenue through direct collaborations with large automotive companies. Additionally, the commercial success of TRIX Connections or the bricklaying robot project contributes to sustained financial support beyond public grants. A detailed breakdown of non-public resources is provided in table 3.5.1.

Selected examples of technology and knowledge transfer:

1. **Blumenbecker Prag – eRobot**
   Collaborative research project
   Reference to project: Technology for industrial robots integration into production systems based on Industry 4.0 (2016-2019)

Within the eRobot project with company Blumenbecker Prag, CIIRC developed a tool for robotic cell designers and programmers capable of optimizing production rate and energy consumption of robotic cells. The tool communicates with a digital twin of a robotic cell designed in Siemens Process Simulate, a design tool used by the EU's main car manufacturers. The tool can automatically read all operations the robots do and, by a smart interplay between optimization and simulation, obtain new parameters of robotic programs such that the tool finds a solution minimizing the cycle time of the cell, energy consumption or the cycle time.
For this achievement, CIIRC and Blumenbecker Prag received the Industry 4.0 Award from the Confederation of Industry of the CR in 2020.
As the partner company could not commercialize the project result (due to some internal issues), CIIRC commercialized the tool for other companies. The first know-how transfer contract was with Continental, helping save 26% of energy on production lines. Another contract with Purem Rakovník (Eberspächer group), led to an optimization method that works without a digital twin. The solution is now used across the entire group.

2. Lego – Smart Counting Machines

Contract research

The collaboration between the CIIRC and LEGO focused on reducing the dependence on experienced counting machine operators, who were difficult to hire and required extensive training. The key innovation was an AI-powered solution seamlessly integrated into LEGO's industrial practice to automate the complex parameter-setting process for vibrating bowls used in Smart Counting Machines on 4PP Lines.

The AI-driven "Virtual Operator" learned optimal machine settings by observing how experienced operators manually tuned the counting machines. It analyzed performance data from different setups, identifying the most efficient configurations and continuously improving through machine learning. This approach allowed the system to autonomously adjust parameters in real time, optimizing performance and reducing the need for manual intervention.

The solution utilized a hybrid IT architecture combining EDGE and Cloud technologies. The EDGE component processed data locally for immediate response and high reliability, while Cloud technologies enabled knowledge sharing across production lines, creating a global and continuously evolving optimization framework.

By embedding AI into industrial practice, the system not only reduced manual labor dependency but also enhanced efficiency, adaptability, and long-term sustainability. With LEGO retaining full intellectual property rights (the project fully funded by industry), the project showcased the Czech Republic's leadership in AI-driven manufacturing innovation.

3. Škoda Auto - The Automotive R&D 4.0 Laboratory

Joint research lab

The Automotive R&D 4.0 Laboratory operates as a joint workplace of the Czech Technical University and the Technical Development division of ŠKODA AUTO a.s (TD Š-A). It focuses on research and pre-development of systems and functions for the automotive industry. The laboratory is equipped with state-of-the-art technologies, including an advanced vehicle driving simulator featuring immersive projection and motion systems, VR tools, car HIL systems, 3D printers, eye-tracking devices, and psycho-physiological measurement instruments.

In the years 2019-2023, the laboratory has conducted extensive work in multiple areas, including the development of partial car systems, interior components, and entire car unit concepts, as well as testing and evaluating HMI (Human-Machine Interface) solutions, including user interfaces (UI) and graphical user interfaces (GUI). It has also focused on the optimization and development of future interior design concepts, the assessment and refinement of UI and GUI elements for assistance systems, and user acceptance studies in automotive environments using advanced simulators.

For TD Š-A., the laboratory has designed completely new user interface elements for vehicle systems, following the entire development cycle—from initial design and prototype implementation to user testing in a simulator.

4. TRIX Connections – CIIRC RP95-3D – protective half mask with replaceable filters

Start-up/Spin-off

Reference to results: Respiration mask. Industrial Design CZ DM/207461. 2020-03-18; Respiration mask. European Union Intellectual Property Office (EUIPO). Industrial Design 7757083. 2020-03-31; Half – mask with replaceable filters prototype;

In March 2020, in response to the COVID-19 protective equipment shortage, CIIRC developed and certified the "CIIRC RP95-3D" half-mask in just one week. Manufactured with HP MultiJet Fusion 3D printers and a replaceable P3 filter, it provided superior protection to FFP3 respirators, offering the highest level of protection (P3), essential for healthcare professionals and high-risk individuals. This effort earned CIIRC prestigious awards, including the European Citizen's Prize (2020) from the European Parliament and an award from the R&D&I Council of the Czech Republic.
To address local shortages, CIIRC adopted a distributed production model, releasing the 3D-printing data under a free license for non-commercial use. Over 100 institutions across 30 countries, including the U.S. Navy and NATO, were able to produce the masks locally, demonstrating international collaboration. This strategy exemplified rapid international dissemination of life-saving technology in crisis response, offering substantial societal benefits.
IPR were licensed to the spin-off company TRIX Connections (exclusively, non-limited), which worked with industrial partners to adapt the design for injection moldings. This shift enabled mass production of up to 10,000 masks daily, significantly lowering costs and ensuring a steady supply. Collaborating with 30 Czech companies helped accelerate production and stimulate the local economy.

5. Wienerberger/Green Build/KM Robotics - Autonomous Bricklaying Robot WLTR

Collaborative research project with licensing

Reference to project: Robotic system for automatic masonry from clay blocks

The bricklaying robot, developed through collaboration between CIIRC, KM Robotics, and Wienerberger with support from the Technology Agency of the Czech Republic, exemplifies efficient technology transfer and commercialization. CIIRC contributed significantly by advancing AI-based methods, developing a precise localization system for identifying brick positions on pallets and in walls. CIIRC also played a role in motion planning algorithms, ensuring optimal robotic arm movements for accurate block placement. Additionally, CIIRC provided expertise in designing robot-ready bricks, consulting on block groove shapes for enhanced automation and efficiency. The system can lay 10m² of brickwork per hour, replacing six construction workers in continuous operation.
The solution was commercialized through a life-long license granted to Wienerberger and KM Robotics, who act as promoters and system distributors. Wall-building services are now provided to construction companies via Green Build Ltd.
The project was awarded 2nd place at the European Robotic Forum 2024 in the Technology Transfer Award category.
Commercialization Strategy: The intellectual property (IP) was commercialized through a one-time licensing model, granting a perpetual license. This ensured:

- Rapid market adoption by eliminating recurring fees, making it attractive early on.
- Clear IP ownership, allowing seamless integration into Wienerberger's commercial portfolio.
- Sustainable impact, as technology can be directly implemented in construction without ongoing development costs.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Patent office services	0/0	0/0	811/32	0/0	0/0
Courses	16/1	0/0	0/0	0/0	0/0

Courses for Applied Sector Employees	86/3	0/0	0/0	0/0	0/0
Symposia, Congresses, Conferences	415/16	10/0	0/0	2 035/80	480/19
Consulting, Assessments, Advisory Services	3 819/151	477/19	726/29	178/7	908/36
Expertise, Measurements, Testing	17 659/697	6 412/253	7 918/312	16 624/656	40 772/1 608
Design, Prototypes, Models	24 515/967	12 399/489	19 610/774	13 667/539	12 119/478
Income from Licensing Agreements	0/0	0/0	350/14	0/0	0/0
R&D Revenue	4 921/194	3 625/143	3 407/134	4 869/192	5 111/202
Mediation Activities	7 230/285	7 120/281	6 429/254	10 647/420	12 950/511
Donations	4 032/159	6 930/273	5 185/205	5 904/233	7 294/288
Total	58 661/2 314	30 043/1 185	39 251/1 548	48 020/1 894	72 340/2 854
Patent office services	0/0	0/0	811/32	0/0	0/0

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF VAVAI

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the evaluated period and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Self-assessment:

Between 2019 and 2023, CIIRC CTU established itself as a key player in the promotion and dissemination of scientific research and technological advancements. This was achieved through both its initiatives and the sustained media presence of its experts in public discourse. The institute actively bridges the gap between advanced research, cutting-edge technology, and public engagement, ensuring broad accessibility and understanding.

CIIRC CTU actively contributes to the popularization of science through media involvement and regular presentations by its leading researchers. Between 2019 and 2023, nearly 7,000 articles mentioning CIIRC CTU were published in professional and mass media (print and online). In terms of outreach, this statistically represents an audience of approx. 529 million (which, according to Monitora Media analytics, can be assessed as advertising value equivalent to CZK 588 million). CIIRC experts often provided expert commentary on key topics in science, technology and industry, helping to shape public understanding. Their contributions have become particularly important during the rise of artificial intelligence and the COVID-19 pandemic, when clear, unbiased and factual communication played a key role in informing the public and decision-makers.

Beyond media outreach, CIIRC CTU organized a wide range of popularization initiatives that engaged a broad spectrum of audiences, from industrial stakeholders to students, the general public, and innovation enthusiasts. Moreover, numerous events were organized, with a significant portion targeting industrial stakeholders and companies, such as Industry 4.0 Open Days, National Summits of Industry, or hands-on workshops focused on specific technologies like AI, laser technology, robotics, cybersecurity or welding. These events promoted public understanding of complex scientific concepts, providing practical insights into advanced technologies and fostering collaboration within the industry.

CIIRC CTU hosted annual popularization events like Researcher's Night, where families, young students, and the general public could interact with scientists and explore cutting-edge research through experiments and presentations. The institute also facilitates guided tours and visits for pupils and students, offering them a closer look at ongoing projects and encouraging future careers in science and technology.

CIIRC CTU also addressed topics on societal impacts of science and technology, such as gender equality in STEM through events and social media campaigns, promoting inclusivity in scientific and technical fields. By engaging various demographics through these initiatives, CIIRC CTU was crucial in making R&D&I more accessible and inspiring the next generation of innovators. A brief selection of popularization activities conducted within the period concerned is elaborated below. Most of the popularization activities continue to evolve, and many of them have been organized up to the present day.

1. **Researcher's Night**

   Since 2019, CIIRC CTU has participated in a traditional annual event, Researcher's Night, dedicated to making science accessible and engaging for the public, in particular for families with kids. The event is part of the whole university program, and it serves as a traditional showcase of groundbreaking research and technological innovations in an interactive format. From CIIRC's perspective, Researcher's Night serves as an important bridge between academic research and society, fostering curiosity and inspiring not only future generations of scientists and engineers but also children, encouraging their interest in science and technology. Through demonstrations adapted even to the youngest audience in a playful way, hands-on activities, and expert talks, CIIRC highlights advancements in robotics, artificial intelligence, biomedicine or cybersecurity. Visitors gain insights into emerging technologies such as autonomous systems, smart factories, VR/AR and AI-driven innovations, which shape the future of industry and everyday life. By bringing complex scientific concepts to a broader audience, Researcher's Night highlights the positive impacts of research and emphasizes its real-world applications. It also encourages collaboration between scientists and the public, addressing concerns about AI and automation while showcasing their benefits. Ultimately, the event reinforces the importance of science in solving global challenges and promoting technological progress.

2. **Events and guided tours for pupils/students**

   CIIRC CTU actively engages young students in science and technology through educational initiatives, fostering early interest in research and innovation. On 10 July 2023, CIIRC CTU participated in the **Children's University**, where fifth- and eighth-grade primary school students explored biomedical and assistive technologies and AI-driven diagnostics at the Cognitive Systems and Neuroscience lab in an engaging way.

   On 13 December 2023, CIIRC CTU organized a guided tour for kids from the **nursery school in Horoměřice at the Testbed for Industry 4.0** at CIIRC CTU, offering them a hands-on experience in human-robot collaboration in simple assembly tasks with an observation of a robot responding to voice commands.

   In 2023, the Institute launched via the National Centre for Industry4.0 (NCI4.0) the "**Technology Literacy (Technologická gramotnost)**", an interactive lecture for primary and secondary school students. Throughout the year, several hundred students had the opportunity to explore topics such as robotics, AI, 5G, IoT, or cybersecurity, compete for prizes, and experience these technologies hands-on in the RICAIP Testbed Prague.

These activities are just a selection of many others that underscore CIIRC CTU's commitment to popularizing science, inspiring students to pursue careers in STEM fields, and contributing to the future of technological innovation and industrial development.

3. **Collaboration with Goethe Institute on cross-domain activities focusing on the intersection of AI, art and societal impacts**

   In 2021, CIIRC CTU advanced the public understanding of AI through its collaboration with the **Goethe-Institute's AI Residency Program**, merging scientific research with artistic creativity. Through the following initiatives, CIIRC CTU has demonstrated its commitment to AI literacy and interdisciplinary collaboration, significantly contributing to AI popularization:
   As part of the pan-European project "**Generation A = Algorithm**", CIIRC **CTU's RICAIP Centre hosted three European artists** for two four-week residencies. French visual artists Douna Lim and Théo Pesso (September 2021) explored algorithms' influence on film production, gaining insights into AI's capabilities and limitations. In November 2021, UK-based artist Lily McCraith examined AI-generated images and text, assessing their impact on perception. At the end of her stay, she live-streamed **a video podcast with Sara Polak**, a Czech AI popularizer, on AI's societal implications. These residencies fostered knowledge exchange between artists and researchers, making AI more accessible to the public while encouraging public discourse on its applications and ethical considerations.

   In September 2020, CIIRC CTU also contributed to the Goethe-Institute's **Robots-in-Residence program**, where female scientists programmed the humanoid robot NAO to interact with visitors at events in Prague. This hands-on experience deepened public engagement with AI and robotics.

4. **Women in Tech: The Gender Algorithm**, held on 12 April 2023, created space for an open discussion about the gender gap in digital technologies and its impact on education, career choices, and industry diversity. Organized by CIIRC CTU in collaboration with the French Embassy, Institut Français de Prague, and La French Tech Prague, it brought together experts, policymakers, and business leaders to address the challenges women face in tech and explore ways to increase their representation.

   With more than 40 participants, the event featured two key panel discussions. The first focused on education, highlighting how stereotypes shape career decisions and why women remain underrepresented in STEM. The second panel explored workplace inclusion, investment opportunities for female-led startups, and strategies to support women in the tech industry.

   The event was open to the public, both in person and online, ensuring broad participation. Attendees had the opportunity to engage with leading voices in the field, discuss key obstacles to gender diversity, and learn from successful initiatives in academia and industry. By raising awareness and fostering dialogue, it contributed to the ongoing effort to promote diversity in STEM and drive meaningful change in the tech sector.

5. **Science communication through online tools - website & social media**
   CIIRC CTU employs a cross-channel communication strategy, leveraging its website and social media to maximize outreach and engagement. The website serves as the central hub, offering comprehensive information for industrial partners, academics, policymakers, and the public. Regular updates, including interviews and popularization articles, ensure that scientific insights are accessible beyond expert circles. Content published on the website often inspires media coverage, further amplifying scientific dissemination.

To enhance impact, CIIRC CTU interconnects website content with its social media platforms, adapting messaging to fit each channel's unique audience and strengths. Institutional profiles on LinkedIn, Facebook, X, and YouTube, alongside specialized profiles for initiatives like the National Centre for Industry 4.0, RICAIP, and the Center of the City of the Future, extend the institute's reach.

A key component of this strategy is live-streaming and recording events. Whenever possible, events are streamed on YouTube and the website, allowing real-time interaction. Recorded sessions are archived in extensive YouTube playlists, ensuring long-term accessibility. The CIIRC YouTube channel, with nearly 4,000 subscribers and 150 videos, features lectures, workshops, and the "Engineering a Truly Intelligent Future" series, reinforcing CIIRC CTU's commitment to sharing research with diverse audiences.

6. **Media presence of leading researchers**

CIIRC also leverages the prominence of its researchers to disseminate scientific knowledge. These appearances not only highlight individual achievements but also serve to make complex scientific concepts more accessible to the public. Through these combined efforts, CIIRC effectively utilizes its online presence and the expertise of its scientists to engage with the public and promote understanding of scientific advancements.

Vladimír Mařík actively engaged in media discussions on Industry 4.0 and the importance of collaboration between academia and industry and underscored the critical role of integrating academic research with industrial practices to drive technological advancement and economic growth.

Tomáš Mikolov, a leading figure in artificial intelligence was frequently featured in podcasts and large scale interviews where he discussed topics like the role of AI in society and its future implications.

Jan Šedivý emerged as a prominent voice in media discussions on AI and chatbots. His insights elucidated complex AI topics, contributing to public understanding and informed discourse.

Zdeněk Hanzálek actively engaged in media discussions on autonomous driving. For example, he presented the "Slalom use case with automated sports car" at the Autoware Center of Excellence seminar in June 2023.

Radek Škoda, a nuclear scientist gained media attention for developing the Teplator - a small modular heavy-water reactor designed exclusively for heat production. His innovative approach has sparked both interest and debate within the energy sector.

7. **Open-Door Days**

Since 2019, Open Days at CIIRC CTU, organized with NCI4.0, have promoted Industry 4.0 technologies, bridging academia and industry. These events provide firsthand experience with cutting-edge digitalization, fostering collaboration between researchers, businesses, and students.

In 2019, two editions introduced Industry 4.0 applications in Czech manufacturing, featuring guest speakers from academia, business, and government. During the 2020 and 2021 pandemic lockdowns, on-site events were replaced with online workshops and professional streams.

The 2022 Open Day, part of **RICAIP Days**, marked the reopening of the Testbed for Industry 4.0 with expert workshops, guided tours, and presentations. The 2023 Open Day, integrated into **Industry AI Days**, celebrated CIIRC's 10th anniversary. The program included interactive demos, roundtables, and AI-focused sessions, attracting 400+ participants.

A highlight was the "**AI Open Day 2023: Trustworthy AI - Humans vs. Algorithms**", featuring live-streamed discussions with European AI Networks of Excellence (NoEs) and AI-driven demonstrations. The event explored AI ethics, transparency, and societal impact, reinforcing CIIRC's role in shaping responsible AI development and promoting Industry 4.0 advancements.

8. **National Summit of Industry**

Between 2019 and 2023, in collaboration with NCI4.0, CIIRC CTU organized the "National Summit of Industry" as an **annual high-level platform for discussions on the digital transformation of the Czech industry.** The event brought together policymakers, industry leaders, and academics, featuring panel discussions, keynote speeches, and case studies on Industry 4.0, AI, and automation. Key topics included digital adoption, workforce upskilling, sustainability, cybersecurity, and industrial resilience, fostering an environment for innovation and economic growth. Through these summits, CIIRC CTU and NCI4.0 **shaped the future of the Czech industry, driving collaboration and technological advancement.**

The 2019 summit established the foundation, addressing digital transformation roadmaps, public-private partnerships, and research-driven innovation. The 2020 edition explored sustainable manufacturing, the circular economy, and AI-driven resource optimization. After a Covid break in 2021, the 2022 summit focused on accelerating digital adoption, improving competitiveness, and aligning education with industry needs.

The 2023 edition, held on May 30, was part of Industry-AI Days, celebrating CIIRC CTU's 10th anniversary. It focused on funding, legislation, and technological diffusion, attracting distinguished speakers from the Czech Republic and abroad. Every summit attracted 170+ participants from among prominent figures in industry, politics, innovation and media.

9. **MSV Brno - International Engineering Fair**

NCI 4.0 and CIIRC CTU actively coordinated a joint exhibition at the International Engineering Fair (MSV) in Brno, promoting Industry 4.0 technologies and fostering collaboration between academia, industry, students, and the general public.

In October 2022, NCI4.0 launched its first joint booth with partners such as T-Mobile, RICAIP Centre, and Česká spořitelna under the "**Technological Island**" concept, highlighting modern manufacturing solutions. The exhibit was part of the MSV TOUR, featuring guided visits to significant displays. A live-streamed "Digi Stage" program included moderated discussions with industry leaders on 5G implementation, digital infrastructures, and industrial resilience. Companies like Kvados shared insights into Industry 4.0 adoption challenges and opportunities.

At MSV 2023 (October 10–13), NCI4.0 partnered with CIIRC CTU's RICAIP Testbed, Siemens, T-Mobile, Česká spořitelna, DEL, SICK, and EIT Manufacturing to present "**Successful Company of the 21st Century**". This 200-square-meter exhibit featured modular production systems, energy monitoring, industrial 5G networks, and virtual reality-simulated production lines.

The exhibitions garnered significant media attention, enhancing public awareness of digitalization and innovative industrial solutions, reinforcing NCI4.0's and CIIRC CTU's role in shaping the Czech Republic's industrial future.

10. **The Inovacast podcast series**

This format was launched in January 2022 through NCI4.0, aiming to popularise Industry 4.0 by featuring interviews with innovative leaders shaping this sector. Professionally moderated, the podcast comprises 40 engaging episodes released biweekly and recorded as personal interviews with 23 speakers. The series delved into the perspectives of Czech industry professionals, exploring their views on current trends and future directions in Industry 4.0, innovations and emerging technologies. The podcast covers a wide array of topics, including digital transformation, automation, and the integration of advanced technologies in manufacturing, providing listeners with valuable insights into the evolving industrial landscape.

By making complex technological topics accessible, Inovacast played an important role in popularizing R&D&I. It served as a bridge between the professional community and the general public, fostering a broader understanding of modern technologies and contributing to

a more informed and innovation-driven society. The series is still available on platforms like Spotify and YouTube, ensuring wide accessibility.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Self-assessment:

CIIRC CTU highly values the feedback and recommendations provided by the evaluation board in the previous evaluation period. The institute has carefully analyzed and systematically implemented these recommendations, integrating them into both short-term actions and long-term strategic planning. The recommendations were treated with great attention and served as a foundation for further institutional improvement. Given that CIIRC CTU received an excellent evaluation, the recommendations primarily addressed the detailed presentation of research outcomes rather than major structural issues. In response, the current evaluation period maximized the allocated space to comprehensively present all relevant results. However, due to space limitations, some achievements, awards, collaborations, and activities could not be included, despite their significance.

Applied Research Projects (Sections 3.2 – 3.4)

"Difficult to say too much about applied and contract research income other than keeping up the good work. Perhaps licensing income could be looked at again. It just seems that with so much research going on there should be more licensing money obtainable."

The SW licensing is still a quite difficult task in the Czech conditions. We were successful just in 3 cases up to now. For example, the license negotiation with Wienerberger (re in 3.5) required vast legal support and involvement of the CEO of Wienerberger in Vienna. In the end the license has brought approx. 6.5 mil. CZK in 2024/2025. Other licenses were acquired by TRIX Connections, s.r.o. and have brought around 0.5 mil CZK up-to-now. We do continue in our efforts.

Applied Research Results (Sections 3.5 – 3.6)

"It would have been nice to see 5 returns in section 3.6 in the first instance. Given the research projects ongoing, we felt that there would be 2 further projects that would qualify and indeed there were. Clearly it would be good to make sure there are 5 ready for the next assessment. Industrial collaboration was evident."

CIIRC CTU continues to play a crucial role in applied research and technology transfer. This was particularly evident during the COVID-19 pandemic, where its research teams, pre-existing technology transfer ecosystem, and commitment to societal benefit played key roles in rapid response initiatives. Details on transfer activities can be found in sections 3.4 and 3.5 of the current evaluation.
There was no problem filling the list of 5 returns. Moreover, CIIRC concentrates on delivering customized services, especially to SMEs, in the area of AI and Industry 4.0 deployment, which has been accelerated thanks to the tools and financial aid provided by the EDIH and TEF/AI-MATTERS schemes since 2023.

Cooperation with the Non-Academic Environment and Technology Transfer (Sections 3.7 – 3.9)

"It would be nice to see a range of examples of successful implementation in section 3.9"

CIIRC CTU has significantly strengthened its role as a national and international leader in industry collaboration through its transfer centers:

- **Centre for Industry 4.0**
- **Centre for Construction 4.0**
- **Centre of the City of the Future**

These centers connect academia, government, municipalities, industry, and business sectors to foster a robust innovative ecosystem. The centers maintain financial sustainability and leverage cutting-edge infrastructure at CIIRC, including:

- **RICAIP Testbed Prague** (cooperating with other testbeds such as RICAIP Testbed Brno and CPIT TL3 at Technical University of Ostrava and tenths of other labs through projects such as AI-MATTERS, AIRISE etc.)
- **RICAIP Centre of Excellence**, which connects Czech testbeds with German research facilities (DFKI and ZeMA).

SMEs, municipalities, and corporations can access European Digital Innovation Hubs (EDIHs), TEF-AI Matters, EIT Manufacturing, and other programs, further enhancing collaboration. Additionally, CIIRC CTU continues to conduct collaborative research and contract-based cooperation with industrial partners both in the Czech Republic and abroad.
Currently a list of successful implementations is full.

Recognition by the Scientific Community (Sections 3.10 – 3.11)

"Very high standard achieved in this section. Good to see that eventually all the slots were filled."

CIIRC CTU researchers have received numerous prestigious recognitions as described in detail in section 3.2. CIIRC CTU researchers actively contribute to international scientific journals, serve on editorial boards, and are frequently invited as keynote speakers at leading conferences and institutions. The institute also hosts distinguished guest lectures at its premises.
To summarize: After 5 years, there are not enough slots for listing all the high-quality awards and achievements.

Popularisation of R&D&I (Section 3.12)

"Whilst events involving the unit have been very well orchestrated, media reports and appearances (TV/radio/magazines/newspapers) were initially absent from the submission, which was a great shame. For the unit such output means better awareness by the public (incl. politicians) of the research being performed by the unit. Additionally, it is important to have other activities such as open days for the public to visit, meeting the staff etc. This is useful for attracting young scholars from schools and high schools and can be an effective tool to gain appropriate young professionals."

In response to the previous evaluation, we would like to emphasize that CIIRC CTU has always prioritized engagement with a wide range of audiences, including the general public, policymakers, and future scholars. Over the past period, we have significantly expanded our media presence across TV, radio, newspapers, and online platforms, ensuring that our research and innovations reach broader audiences beyond academia and industry. Researchers actively participate in public discussions, media interviews, and outreach programs, providing insights into emerging technologies such as artificial intelligence. Throughout 2019 – 2023 there were published almost 7000 articles in the media about CIIRC CTU, its activities and research.

Additionally, we have actively organized open days, public lectures, and outreach activities aimed at inspiring young talent and fostering interest in cutting-edge research. These efforts are not new; they were already in place during the last reporting period. Moving forward, we remain committed to making our outreach efforts even more visible and impactful, ensuring that our contributions to society are fully recognized.

Addressing Additional Recommendations

Student Engagement

CIIRC CTU actively involves students from an early stage in their academic journey. Several examples are described in detail in section 3.6, other include student involvement into research through their semestral, bachelor or master thesis at CIIRC labs.

Scientific Cooperation with European Institutions

CIIRC CTU has established itself as a key player in European research collaborations, actively participating in:

- European Networks of Excellence Centers in AI, Data and Robotics
- European research projects (Horizon 2020, ERC, etc.)

Further details are provided in sections 3.2 and 3.3 of the current report.

Interdisciplinary Activities

CIIRC CTU fosters interdisciplinary collaboration across research domains as was shown in sections 3.2 – 3.6. What was not mentioned is participation in **TAH (Technologies, Art, Humanities) Innovation Centre** since 2023. TAH plays a pivotal role in advancing interdisciplinary education and research in the Czech Republic.

PhD Program Development

A dedicated PhD program has been a long-term strategic goal of CIIRC CTU. In 2024, significant progress was achieved through collaboration with the **Faculty of Electrical Engineering of CTU**. CIIRC is now a **Training Department**, offering top-tier education and research opportunities in informatics, robotics, cybernetics, and bioengineering.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
CIIRC web	all	https://www.ciirc.cvut.cz/

CIIRC research selected results	3.3, 3.4.,3.5	https://www.ciirc.cvut.cz/cs/recent-results/
CIIRC running projects	3.3	https://www.ciirc.cvut.cz/cs/research-education/projects/
CIIRC past projects	3.3	https://www.ciirc.cvut.cz/cs/research-education/past-projects/
CIIRC press releases	3.2. 3.6	https://www.ciirc.cvut.cz/cs/category/press-releases/
CIIRC multimedia	3.2, 3.6.	https://www.ciirc.cvut.cz/cs/category/multimedia/
CIIRC news	3.2, 3.6	https://www.ciirc.cvut.cz/cs/category/news/
CIIRC YouTube Channel	3.6	https://www.youtube.com/@ciircctu
CIIRC LinkedIn Profile	3.6	https://www.linkedin.com/company/ciirc
CIIRC Facebook Profile	3.6	https://www.facebook.com/ciircctu
CIIRC X Profile	3.6	https://x.com/CIIRCCTU